MICRO COMPUTER PRINTOUT

A PLAIN MAN'S GUIDE TO PERSONAL COMPUTING

JULY
95p

Video vs. Computer Games

How BASIC Works

Computer Jargon Explained

Assembler for Beginners

What the Salesman WONT tell you!

10 Amazing Facts about Micros

3 Cheap Computers Compared

Beginners Guide to Word Processing

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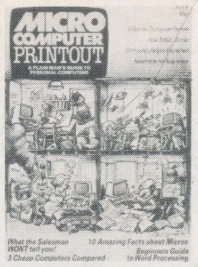
Volume 2 Number 6

July 1981



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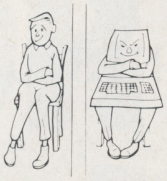

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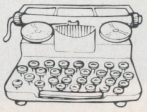

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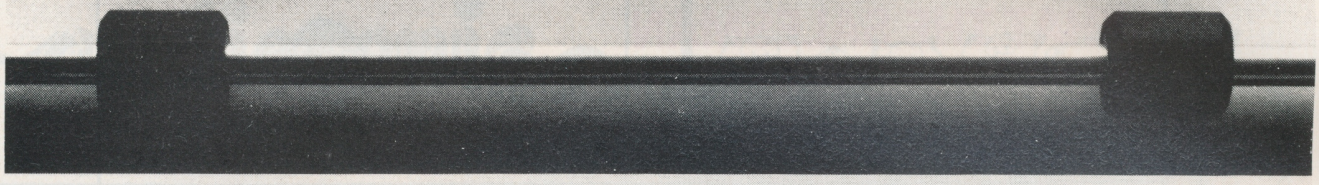
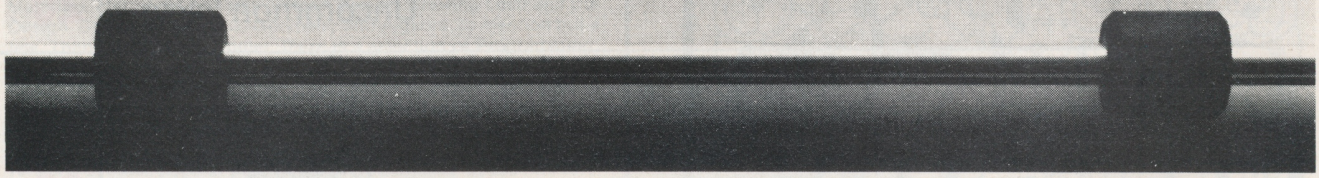


YOU NEED A PRINTER THAT PRINTS LIKE THIS.



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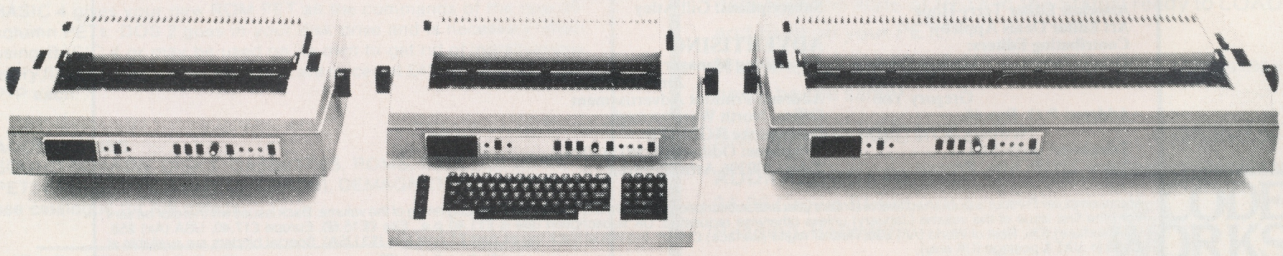

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"**Conclusions**
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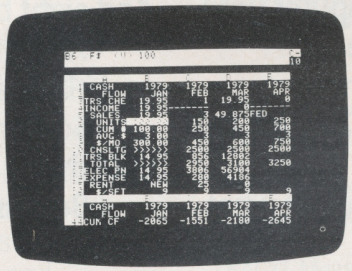

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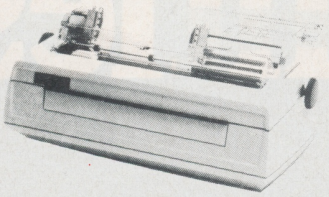

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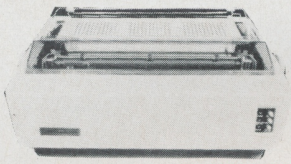

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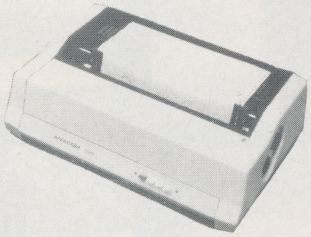

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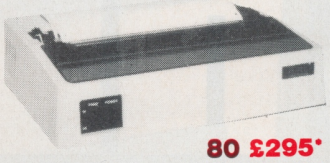

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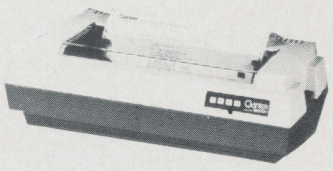

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READ/WRITE . .

An End to Programming?

I saw an advertisement recently in the national press, for a program which writes other programs. It seemed to suggest that any user could now produce his applications without learning to program.

Being an absolute beginner I may have got the wrong end of the stick, but it would seem to render all specialist business programs obsolete. Surely such a development should be front-page news for your magazine - why has it not been mentioned:

Phil Atley,
19 Shakespeare Road,
Thatcham,
Newbury

We think you are probably talking about a program called *The Last One*, which has already caused something of a sensation amongst existing software suppliers. We have pledged to review this as soon as the suppliers, DJ(AI) Systems, have finished "testing" it.

Because we have not yet seen *The Last One,* we cannot make any authoritative statements about its capability, but here are some general points about programs which write programs.

1) The basic idea is perfectly valid although computer scientists have a well known proof that states that you cannot write a program that could write *any* program. You must keep to one general area - which in the the case of *The Last One* would seem to be Business.

2) It is true that you don't need to learn any programming language to use such a system. Nevertheless, you must still be able to perform the systems analysis which is usually the difficult part. This involves analysing the way your business is transacted into a series of operations that a computer could handle. When a normal package is written, this process can take as long as writing the final code.

3) While it is true that a program will write 'bug free' code - provided it is bug free itself - there is no guarantee that the system you specify will be bug free. Even experts can get it wrong.

4) A program which writes programs is essentially a high level compiler *(see our report this issue)* compiling from a language that closely approaches English to a computer language. As such, the time saving is enormous, but you shouldn't forget that compilers produce so-called gross-code which is almost never as efficient as if the program had been written by a programmer.

We welcome the arrival of such ideas, and of *The Last One* and will be keeping you informed. We do, however, advise readers to proceed with some caution. Read the reviews; get a demonstration and testimonials from existing users; you should then have no problems.

The VIC v. the PET

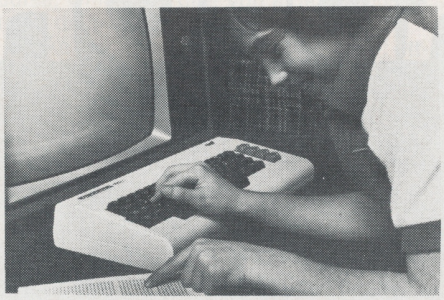
If I have read your editorials aright, Commodore are to bring out a new computer called VIC. It puzzles me that this VIC seems to have all the features of PET but at a third of the price. I know the cost of components is falling, but surely there has to be a catch!

Kevin Brady

No catch, Kevin. The VIC design is based on the PET but with only 20% of the components! It seems that Commodore will market VIC as the home users machine and promote PET more and more for business or professional use. We think that at £189 VIC represents excellent value for money, but since you ask, here are the drawbacks.

1) Physical packaging. The VIC is not as rugged as the PET and lacks a built-in screen. You connect it to your T.V.

2) Memory. The standard VIC has only 5K bytes of memory of which 3.5K is usable. This is expandable up to the full 32K with plug-in cartridges which Commodore will sell.



3) The screen has 22 columns instead of 40 or 80, so listings can look a bit messy. The characters are larger than a PET's screen, but perhaps not as 'crisp'.

4) VIC peripherals will be much cheaper than PET ones, but less sophisticated. There is talk, however, of an interface which will allow PET and VIC to use each other's devices.

That's about it, really. The BASIC, the processor and much of the interfacing is identical, and there are a whole lot of features existing and planned for use which PET doesn't have. Watch the news pages for details.

Save Ink - Bath with a Friend

If any readers have one of the new Commodore 8024 printers, they can make the ribbons last longer by setting the Forms Thickness Control to 2 or 3, even though they are only using single part stationery. I have found that this still produces acceptable print, but as the needles don't hit the ribbon so hard, they use less ink. Obviously as the ribbon gets older, the setting can be returned to 1 as necesary.

Chris Preston,
104 Tresham Road,
Birmingham B44

Learning Machine Code.

Like Barry Gilpin whose letter was mentioned in Gavin Sanders' page in the May issue of *Printout*, I am not yet into machine language programming, and neither, I am sure, are other PET-owners. I did learn a little from Gavin's article but I think that not all of us see other magazines, and not all machine language listings that we do see are suitable for our purposes or printed out as Gavin indicates. Therefore the article would have been greatly improved if he had included a useful short program in machine language that we could practice on. Perhaps this could be done in a future issue of *Printout*.

I would also like to know how one gets started in machine language programming. What is the best beginner's book?

A. G. Rickwood,
61 Oakfield Road,
W. Croydon

Your word is our command, Mr. Rickwood. So turn to page 47 where you will find the first part of Mike Gross-Niklaus' excellent introduction to Assembler. For further help, consult the Book Guide we published in May. Particularly recommended was 6502 Assembly Language Programming by Lance Leventhal, published by Osborne/McGraw Hill.

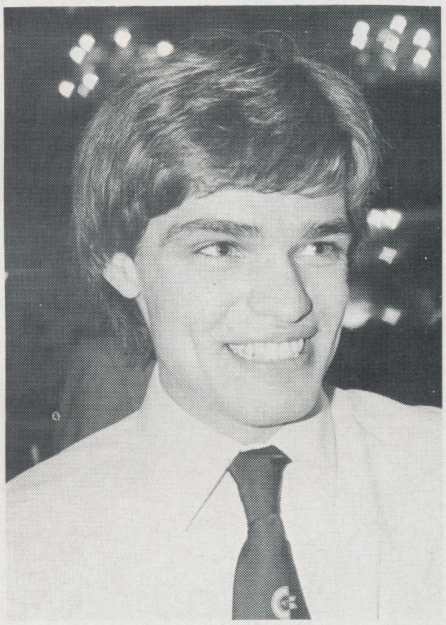
Commodore's Modem - Is there a bug?

The case for and against the Commodore modem has been fiercely argued in our last two issues by Mike Whitehead, defending, and Tony Jeffree, prosecuting. An enraged Mike Whitehead now replies:

I take pen (computer) in hand with reference to the ill-conceived mud-slinging attempts of one T. Jeffree.

1) The Commodore 8010 modem is the cheapest PET-Telephone interface available. At £225 it is about £100 cheaper than alternative solutions such as bi-directional IEEE/RS-232 interface plus RS-232 modem. This is a significant incentive to the market to 'Make It Work'.

2) 'Two Box' solutions (as above) to the PET communications hardware problem were of interest as long as there was no proper solution on the market. Now that there is an IEEE modem available from the manufacturer of the computer itself (if only by courtesy of L.L.L. and Star!), surely the businessman would be wisest to buy all from one source. And clearly the 8010 is the one coupler that software suppliers must support for comm's software, whether or not they choose to support other hardware as well.



3) Using the SRQ signal from the 8010 (sensed by PEEK(59427)AND128, and reset by PEEK(59426)), this becomes the most efficient 300 baud coupler for the PET. When a character is not present in the 8010's incoming buffer the PET can sense it by a purely RAM based test for SRQ. This is, of course, much faster than 64 milli-second timeout, and even faster than the technique of returning a zero when no character is available -because no IEEE traffic is required.

4) The software danger inherent in the 8010, untalking as a character arrives at the modem, is avoided by using SRQ. It has a synchronising effect. SRQ is set as a character comes in. The software immediately senses this, and goes to retrieve the character - untalking the modem as it exits with the character. As each character is removed only when it arrives, and very soon after it arrives, there is no chance that the untalk will occur as another character arrives. There is a minimum of 33 milli-seconds between character arrivals, and it doesn't take anything like that long to sense and remove a character from the modem.

5) Since the 8010 is a dedicated acoustic coupler, I see no handicap in the fact that the only speed at which is can operate is 300 baud (30 characters per second). Since this is the highest speed at which our abominable GPO lines can operate reliably, and since this speed is universally supported through the market, who would want to use any other transmission speed on a telephone connection.

I'm sure that the above has made the facts of this issue perfectly clear. In the words of the immortal John Chew - 'It couldn't be simpler!'

Mike Whitehead,
Bristol Software Factory,
Strathearn House,
88 Queens Road,
Clifton, Bristol.

Over to you, Tony!

WORDFORM

from

LANDSOFT

WORDFORM is a remarkable machine code word processing program with a truly remarkable price tag.

It brings excellent word processing capability to those PET users who, until now, couldn't justify the price of the superior programs.

No one, until they have seen WORDFORM should buy a word processing package. It will probably do everything most users require.

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How Much Memory?

I have been considering the purchase of a microcomputer for about three months and have pretty well decided on a PET - thanks in part to your magazine. My problem is that I have no idea how much Random Access Memory (RAM) I shall need - is 8K enough, or 16K? It seems pointless to buy a 32K machine outright when I could save money and expand later. Can you help, because I have become totally confused by conflicting advice from friends and computer dealers?

R.H. Cooper

Let's try to clarify what memory is for, first of all. The amount of RAM a microcomputer has determines the amount of information it can hold at any one time. It bears no relation to the information which you can store "off-line" on cassette tape or floppy disk. If you intend to use the PET purely for entertainment, then 8K should be sufficient This is because most commercial game or learning programs will run in 8K or less (reputable firms state the RAM requirements in their catalogue - but if doubtful, check before buying). You will probably want to learn to program too, but it is unlikely you will be writing programs of more than 8K for a good many months!

But if you intend to use it for business or may want to in the future, then we would advise you to go for 32K straight away, because virtually all professional business packages require it. You'll need a disk unit too, of course, which will give you at least 300K of stored data.

Unlike say, the Apple disks, the act of attaching a Commodore disk does not in itself require any more RAM, since the disk is "intelligent" and has its own internal RAM and operating system. But the PET needs its RAM to store information which must be accessed almost 'instantly', as when sorting a list of names and addresses.

One final word: if you do discover that you need more RAM, then you can always expand with one of the add-on memory boards or boxes offered by independent suppliers. But don't build this into your buying plans. As you will have seen from our comments in the last issue, it is always cheaper and more satisfactory to buy as much RAM as you can afford at the outset.

Day to Day Routine

Here is a routine that should be of interest to readers who wish to input dates without being tied down to a fixed format. The decimal point is used as a delimiter for economy of hand movements. After decoding D, M, Y the usual formula is used to convert to day-of-the-year.

I recently fitted a new counter to the cassette deck. The parts are easily obtainable from Philips Service Centres. It cost me about £8 and took one evening. I would be happy to provide the instructions to readers upon receipt of a stamped self-addressed envelope.

Ron Plater,
133 Bromley Common,
Bromley, Kent

Double thanks, Ron, for the routine and for the kind offer, which we are sure will interest all those who have struggled to locate one program out of many on a tape. Julian Allason tells us he saw Commodore cassette units with built-in counters whilst in the States. About time too, say we. One last thing, Ron; you forgot to date your letter .....

```
12000 REM* ROUTINE GIVES DAY OF YEAR
12100 REM* USING ANY FORMAT,EG 1.1.80

FROM NUMERIC PAD + DECIMAL POINT
 12.01.1952, 01.02.79, ETC

12600 PRINT"[CLR]          DAY OF YEAR
12610 INPUT"[CUD]DATE(D.M.Y)";DT$
12620 P1=0:P2=0:REM DECIMAL POINTS
12630 FORI=1TO6
12640 IFMID$(DT$,I,1)<>"."THENI2670
12650 IFP1=0THENP1=I
12660 P2=I
12670 NEXT
12680 D=VAL(LEFT$(DT$,P1-1))
12690 M=VAL(MID$(DT$,P1+1,P2-P1-1))
12700 Y=VAL(MID$(DT$,P2+1))
12710 DY=D+INT((M-1)*30.6)-1.7
12720 IFM<3THENDY=DY+M+1
12730 IFM>2ANDINT(Y/4)=Y/4THENDY=DY+1
12750 REM***** OPTIONAL OUTPUT *****
12760 PRINT"[CUU]"DT$"
12770 PRINTTAB(12)"[CUU]DAY ="DY
12780 GOTO12610
```

Note: [CUU] = cursor up
[CUD] = cursor down.

Pi-Eyed

In your January issue, Mr. J.A. Tanner asked for a method of using the value π on the 8032 PET. Commodore had suggested:-

1 POKE 1042,255:PI=I

which gives a value for which the least significant digit of the binary mantissa is incorrect. As a result SIN(PI)≠0. My investigation of this revealed the most extraordinary can of worms in PET BASIC's rounding mechanism for input and output statements.

The best advice for π is to start a program with the statement:

1 PI=3.141592654

which will guarantee that any tests for the sine of multiples of π will be absolute zero. But:- ?PI will produce 3.14159266. Hence my investigation of rounding digits. A bit π-eyed if you ask me!

Ken Rose,
Hambleside, Croft Way,
Warsash,
Southampton

Ken has offered to write up the results of his investigation into the "can of worms" and *Printout* will be publishing a report on rounding errors, shortly.

Don't Run Out of Variables!

Speaking to someone with a new PET the other day, he remarked that many programmers use variables like A, B, C, and then X,Y,Z, and then others on a random basis - only to find that they've used the same variable for more than one function. I asked him how many variables he thought there were; he replied that there "must be hundreds".

So, let's take a look at how many variables there **are** on the PET. You may be surprised!

Firstly, there's the 26 single alpha characters, A-Z. Each one of these can be used with a secondary alpha-numeric character, 0-9 or A-Z. That's another 936 variables.

All of these variable names are also available for, quite separate, integer variables - A%, AA%. A1% etc., used for whole numbers - that's another 962. Then there's 962 string variables - A$, AA$, A1$ etc., making a total of 2886 simple variables.

Is that enough? No, any of these numeric, integer or string variable names can be used for arrays; A(1), A%(1), A$(1) etc., quite separate from the simple variable of the same name. Even if we count every array as a single variable, that's another 2886. If we ignore a few variable names which cannot be used because they form BASIC's 'reserved' words, ON, GO, TO, etc., there's a total of about 5750 variables available!

Here's a short routine to list these variables in order. For the 40 column screen this shows the three types of simple variable, and one array, for each variable name. If you're listing on an 80 column screen or a printer you can add integer arrays and string arrays in line 140:

```
100 FORA=65TO90:FORB=32TO90
110 IFB=33THENB=48
120 IFB=58THENB=65
130 A$=CHR$(A)+CHR$(B)
140 PRINTA$,A$"%",A$"$",A$"()"
150 NEXT:PRINT:NEXT
```

Granville Kirkup,
Bondfield House,
Bond End,
Yoxall, Staffs

Granville also sent us a 16 page printout of this program listing *every* variable. After the laughter had died away, someone pointed out that it *was* a useful idea because the tabulated space allows the programmer to keep a written record of variables used. Keep them coming, Granville.

DTL - BASIC

A Basic COMPILER for a new and better way of running programs on your Commodore Microcomputer

DTL-BASIC is a compiler that is 99% compatible with existing BASIC programs running on your PET.

Consider these benefits to you:-

1. Compiled programs run much faster: typically for large programs 10-20 times faster.
2. DTL-BASIC is almost totally compatible with the Interpreter - use the Interpreter for program development and then compile for efficient running.
3. The Compiler implements true integer arithmetic.
4. The Compiler will accept extensions to BASIC.
5. Compiled programs require half as much store - allows the implementation of very big BASIC programs.
6. Compiled programs cannot be listed or altered.

DTL-BASIC is disk based, requires a 32K PET and comes complete with an in-depth users manual.

Version 1 for 3032 & 3040	£300.00
Prices exclude VAT.	
Version 2 for 4032 & 4040	£300.00
Version 3 for 8032 & 8050	£360.00

Special prices for educational establishments - ask for details.

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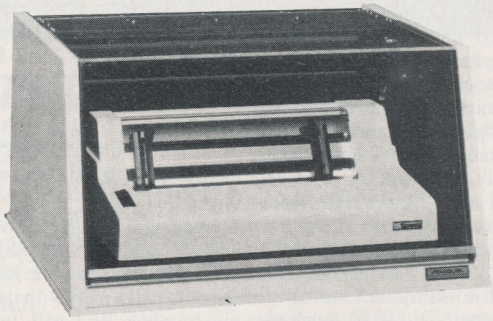

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THE ARROW

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Available for any spare socket (please state requirement).

Price: **£30.00** plus VAT

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HOTLINE

What's up at Commodore?

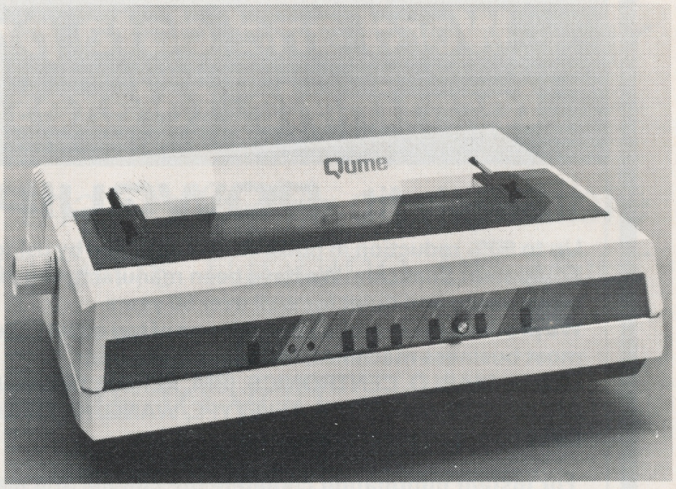
Despite two years of development work, and prototype showings at no less than five international exhibitions, information in *Printout's* possession leads us to believe that Commodore have effectively scrapped their 8" disk drive project.

The two units designated 8061 and 8062 have had a history of teething troubles and falling development priorities - caused, in part, by their high specification. Capacities were to be 1.6 and 3.2 megabytes respectively, with 16K of on-board RAM and an option of IBM-compatible formatting.

To compensate for this, the 8050 twin 5" drive unit will be offered in an uprated form by the end of the year. Designated the 8250, it will use double sided drives to achieve a formatted capacity of 2 megabytes - with a new Disk Operating System also.

Higher up the scale, *Printout* has already reported the development work on mini-Winchester drives at Commodore, Santa Clara. Although this is not believed to be at an advanced stage, the concept looks interesting . A 5" hard disk will supply the main storage of 5.29 megabytes upwards, with a conventional floppy disk drive alongside for backup. According to John Feagans - chief development engineer - "The backup will be intelligent in that the only information which changes will be stored on the floppy. This avoids the need to run 10 floppies through the system every day for backup".

Back in the UK, Bob Gleadow stated that Commodore would shortly have a complete range of systems from the VIC with its peripherals, to a 96K PET with *high-resolution* graphics and 2 megabytes of disk.



Secretaries delight

How about this for a really neat looking daisywheel printer from Qume? They claim that it has a new carriage mechanism developed by MicroDrive which results in a longer life, better quality, longer mean time before failure and 30% fewer parts. Doubtless all very interesting for the Data Processing Managers, but we think it's the secretaries who are going to love this.

You see, it has a "clean hands" ribbon cartridge, reduced noise level, proportional space typing and "new contemporary exterior styling". All we need now are a few in-built potted plants and word processing would catch on like a bush fire.....

Anyway, whether you are the DP Manager or secretary, it's called the SPRINT 9 and Qume (UK) Ltd are at Bridgewater Close, Reading, Berks. Tel: 0734 584646.

Bugging debugged

Here in *Printout* we like to keep our News section purely informative - and don't encourage our Newsdesk hacks to mix with shady types like Inside Trader. Nevertheless, we felt it necessary to give a little space to a product about which he really enthuses. Needless to say it's a data encryption unit, designed for use with Synchronous or Asynchronous Modems, and it comes from NCL, Fieldings Road, Cheshunt, Herts.

You see, I.T. has long suspected that his telephone is bugged, and with so much information arriving as electronic mail these days, sources were rapidly drying up. Thanks to this new and exciting application of microchips, all is well again. With over 10 to the power of 2000 base keys, his enemies are going to be confused for a good long time yet!

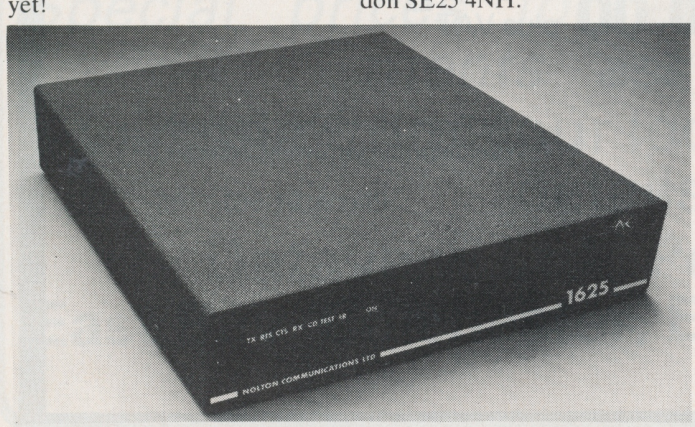
It's in the post, Sir

Want to learn Machine Code? What are the options open to you? Well, first you can read a book (we recommended several in our May issue), provided you have a degree in Understanding Technical Jargon.

Or you can go on a training course - which is by far the best way. But what if you can't afford the time or expense?

IPUG, the Independent PET User Group, have come up with an idea that's really great - a postal course in Machine Code. Open to members of IPUG, the cost runs to a horrendous £1 plus six stamped addressed envlopes - which if your maths is letting you down adds up to £1.84. Each unit is designed so that it must be mastered before proceeding.

Based on the PET, the content of early papers does not require access to a machine. So if you are a member of IPUG and can scrape together all that money, write to: Fred Offler, 37 Brooklyn Road, South Norwood, London SE25 4NH.



Cosmopolitan Programming

The trouble with writing programs is they seldom work on any other machine. That is a particular problem in the education sector, where the eclectic choice of machines makes the distribution of teaching software difficult.

With the aid of financial backing from the Microelectronics in Education Programme (see page 23), the Schools Council Computers in the Curriculum Project (and only the land of Academia could come up with a title like that!) has developed what they think is a solution to the problem.

The system consists of a library of instructions and routines which are incorporated by the programmer into his source code. A special disk is made up for each type of computer, and at the first 'run' of an application program, all marked lines of code are changed on the new computer.

Currently only the 380Z and Apple computers have been handled, with the PET and Exidy Sorceror to follow shortly. £25 will buy an author all the routines, from the project's head office: Chelsea College, University of London, Manresa Road, London SW3 6LX. Interested parties can contact David Riddle on 01-351 2488 Ext. 235.

Take your PET on holiday

Have you ever been out into the country on a picnic, only to discover that you have left your favourite micro at home. Never fear, help is at hand with the new PET Transporter from .....

Actually no, this photo was sent in by Handy Angle who make those square steel tubes.

Their product had been used by a computer dealer to make a rather useful demonstration table. The whole thing folds up to fit completely into the back of a car. That way, the salesman doesn't lose the crease in his trousers and half an hour to boot, setting up the system later. We particularly liked the hammer seen hanging in the background - for repairing faulty disk drives no doubt!

HOTLINE

CBM hand over software

In a surprise move, Commodore have handed over the marketing of its entire range of cassette software to Audiogenic of Reading, who for the past few months have undertaken all their cassette reproduction.

Audiogenic's M.D., Martin Maynard says he is planning "extensive repackaging of programs, particularly amongst the educational titles, to bring them more into line with what schools can afford". Where Commodore had previously offered five different Physics teaching aids at £10 each, Audiogenic will now "bundle" all five into a single product selling at £20. Similarly for games - which as with the other titles, will be converted to run on all models of PET, and on disk. 20 titles will be offered on disk at £20.

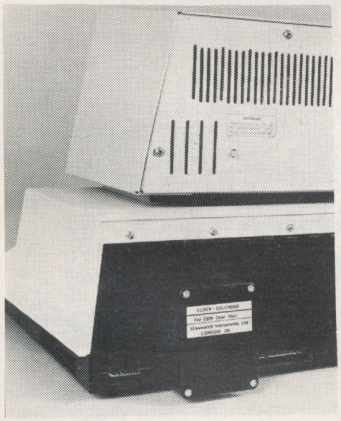
Maynard also hopes to encourage local dealers to stock a larger range by abolishing the previous minimum order quantity. "Commodore", he says, "will still be handling the acquisition of new software, and royalty payments to authors." Audiogenic, however, intend to release some software of their own including programs for the new VIC computer and "a utility that will make the 80 column PET look like 40 column, for compatibility". To cope with this his book sales are being chopped and the old stock sold off cheap at the PET Show.

Working with machine level maestro Harry Broomhall, Maynard has developed a new system for cassette reproduction, which not only increases reliability, but will encode a batch number into the recording, so that pirated copies can be traced. The company say they will prosecute any pirates so identified.

What's the date, mate?

Are you annoyed by business programs which continually ask you this question? Would you like to know what the time is while running your favourite game? Or what about process control applications, where accurate interrupt-driven routines are essential?

The answer to these and lots more problems is to be found in a little black box which fits on PET's user port - or indeed any other micro with an 8-bit parallel interface - (see photo).



Backed up by two alkaline cells which last two years, and accurate to within seconds per month, it supplies the micro with 24-hour time and date - including the day of the week.

This data can be incorporated into BASIC strings for manipulation, display on screen or printing on forms. Some standard software is included in the package.

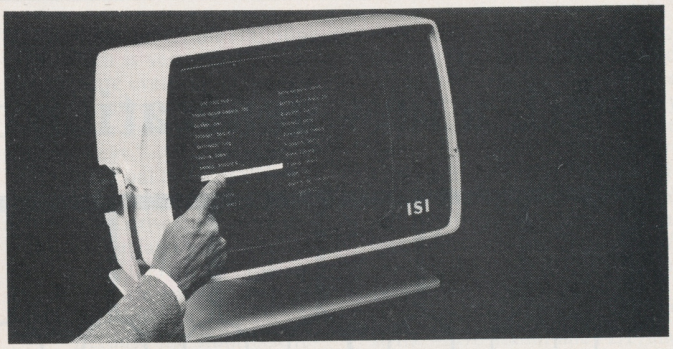
Amongst the other features is a small speaker, coupling onto the CB2 line, and a hardware adjustable internal timer for process control.

The people responsible are Greenwich Instruments, who can be found at 22 Bardsley Lane, Greenwich, London SE10 9RF.

High Resolution, Low Cost

Good news for PET users who have been casting covetous eyes on high resolution graphics - like wot them other computers 'ave. Supersoft will shortly be releasing a new board which fits on your PET giving the option of normal 'block' graphics or high resolution 'pixels' for fine drawings and graphs. The board has 8K of its own RAM for mapping out the screen.

When high resolution is not required the additional memory can be used for data. Special graphic software is incorporated in an EPROM chip, and the empty ROM sockets are replicated on the board. Peter Calver of Supersoft told *Printout* "We have designed the board to be as near plug-in as possible, so no soldering is required". The price is expected to be less than £150, around half the cost of competitive units. Calver also plans to offer a budget version at £99 which will require some soldering and will rely on cassette loaded software.



Computers get "touchy"

Who was it first said - "Children have a keener sense of touch, but adults get more fun out of it"? Well, now it seems that computers are getting in on the act, with the latest product from Interaction Systems Inc.

This is a touch sensitive screen designed for use by people who have no computer experience, or to whom a keyboard might form a psychological barrier. Given suitable database-type software, the user simply works his way to the information required by pointing to the option required on each screenful. They have been successfully used as information terminals at exhibitions.

The good thing is that you don't have to buy a complete new monitor or terminal since the touch sensitive screen is available as a kit to fit over any 12" or 15" screen. A PCB containing a Z-80 will interface the screen to any serial or parallel microcomputer port.

An evaluation kit is available for $945 from Interactive Systems Inc., 24 Munroe Street, Newtonville, Massachusetts 02160.

Production quantities for any aspiring entrepreneur will cost under $400.

THE CP/M STUNT

Can Mr Rowe's black box solve the software problem?

It is not that there aren't any good business programs for microcomputers; quite the contrary. It is just that big computers still have the edge, both in terms of quantity and quality of programs available. Microcomputer manufacturers have been casting covetous eyes on this pool of big computer software for ages. The problem is that very little of it is written in "the beginners language", BASIC. Most such programs are written in more sophisticated computer languages such as FORTRAN (short for FORmula TRANslation language), ALGOL and COBOL (COmmon Business Orientated Language). And to run these languages you need an operating system that will support them.

Needless to say the experts don't all agree (do they ever?) on the *best* Operating System available. What they can't dispute is that one called CP/M is the most widespread.

But the drawback to CP/M is that it only functions with Z80 microprocessors, and there is not much prospect of a change in the forseeable future. Which is bad news for owners of computers like PET, Apple and Atari, which are based on a different microprocessor, the 6502. The television naturists (naturalists, surely? - ED) would probably describe this situation as a vast ecosystem of software with each package dependent upon another for its existance, resulting in evolutionary impasse pending the overcoming of the Z80 constraint. We would call it a mess.

Apple cunningly sidestepped the tricky political issue of changing microprocessors by offering an *external* Z80 printed circuit board, the Z-80 softcard, which could run the CP/M operating system as well as handling sundry oddjobs delegated to it by the resident 6502 central processor.

Commodore adopted their normal dynamic stance of waiting for one of the independent suppliers to solve the problem. Which is the cue to introduce one of the computer businesses tallest and most controversial mavericks, Derek Rowe, whose entrepreneurial wanderings have so far led him into microcomputers, aviation fuel, truck spares, and even a short spell inside Commodore. Rowe is currently Managing Director of Small Systems Engineering Ltd - a company with an established reputation for hardware interfaces.

His latest box of tricks is certainly impressive, but then the man's sheer vibrant enthusiasm

Increase your PET'S Basic by one third!

with a new generation of 4kb expansion Roms

COMMAND-O

BASIC FOUR USERS - COMPARE:	COMMAND-O 4KB ROM	TOOLKIT 2KB ROM
AUTO	Yes	Yes
DUMP	Yes	Yes
DELETE	Yes	Yes
HELP	Yes	Yes
FIND	Yes*	Yes
RENUMBER	Yes*	Yes
TRACE, STEP	Yes*	Yes
OFF, KILL/BYE	Yes	Yes
MOVE (8032)	Yes	No
SEND (IEEE/DISK)	Yes	No
INITIALIZE (DISK)	Yes	No
EXECUTE (DISK)	Yes	No
MERGE, MERGE#	Yes	No
PRINT USING	Yes	No
BEEP (CB2)	Yes	No
SCROLL, OUT	Yes	No
SET SOFTKEY	Yes	No
'EAT' KEY	Yes	No
REPEAT KEY (4032)	Yes	No
CTRL KEYS (8032)	Yes	No

* IMPROVED

BASIC TWO USERS - COMPARE:	DISK-O-PRO 4KB ROM	BASIC 4 UPGRADE
DIRECTORY, CATALOG	Yes	Yes
DLOAD, DSAVE	Yes	Yes
DOPEN, DCLOSE	Yes	Yes
SCRATCH, RENAME	Yes	Yes
COPY, BACKUP	Yes	Yes
RECORD, APPEND	Yes	Yes
CONCAT, COLLECT	Yes	Yes
HEADER	Yes	Yes
DS, DS$, AUTO-LOAD	Yes	Yes
SEND (IEEE/DISK)	Yes	No
INITIALIZE (DISK)	Yes	No
EXECUTE (DISK)	Yes	No
MERGE, MERGE#	Yes	No
PRINT USING	Yes	No
BEEP (CB2)	Yes	No
SCROLL, OUT	Yes	No
SET SOFTKEY	Yes	No
'EAT' KEY	Yes	No
REPEAT KEY	Yes	No
KILL	Yes	No
KEEP SAME TOOLKIT	YES	NO

DISK-O-PRO

COMMAND-O (£50.00 + Vat) for Basic 4 CBM/PETS 4008-16-32 (40-col) & 8016-32 (80-col) DISK-O-PRO (£50.00 + Vat) is for Basic 2 PET Models 2001-08-16-32 and 3008-3016-3032 COMMAND-O and DISK-O-PRO are both 4KB masked Roms, not Eprom or disk-based, and come with 80-page manuals by Greg Yob and Jim Berkey. Users of Visicalc or other Roms in the UD12 (80-col.) or UD3 (40-col.) expansion Rom slots will require SPACEMAKER II, either 2 or 4 Rom models, at £21.95 or £29.95 + Vat. DEALER and OVERSEAS enquiries to: Calco Software, Lakeside House, Kingston Hill, Surrey, KT2 7QT, Tel: 01-546-7256 Overseas P & P: please add £3.00 airmail (Europe), or £5.00 airmail (outside Europe)

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could make a simple resistor sound impressive. It is a mystery that the conference business have never discovered him. His discourse on Commodore's system software is simultaneously hair-raising and hilarious. But back to business.

The new black box is a microcomputer in itself, which fits in between the PET and its disks, purely on the IEEE bus. It contains 4K bytes of system software in ROM, 60K of RAM, and a Z80 running at 4MHz, which enables it to run CP/M. Our first reaction was that £550 was outrageous for an interface; yet when you consider what you are buying gives you a whole new computer, it really seems quite reasonable.

Understanding how the system works is a truly mind-bending exercise. Rowe says "you don't have to understand it because the process is completely transparent to the user". Nevertheless this is (more or less) what happens. Upon switching on, the CP/M disk is inserted in the disk drive and the RUN/STOP and shift keys depressed in the usual way. At this point PET undergoes a rapid metamorphosis. The 6502 and on-board RAM are now used purely to emulate a terminal. Which terminal? "Anything you like." says Rowe "We already have a simulator for the Hazeltine 1500 which is very popular, and the software even covers the keyboard driver, so that PET's keyboard has a true Alpha-shift, and control keys." All processing is now carried out by the Z80 in the "stunt box" - which, can handle up to four disk drives. If you have a 3040 disk and later want to add an 8050 *as well* there is no problem, as the software automatically reconfigures itself.

Because the stunt box requires no hardware modification to the PET, you simply switch off and on to revert to your PET and disk system.

Access to all that software is the principal advantage, and according to Rowe, established vendors of such packages, like Lifeboat Associates, can supply any of their titles in a compatible form. The CP/M 'Hit Parade' currently features: COBOL Compilers, ALGOL, LISP, Coral 66 and APL, plus many more applications packages including *Wordstar* - surely the best Word Processing package for any micro.

With the addition of a 6809 to the Micro Mainframe PET, and now the PETs demotion to terminal emulator, there will be those who feel that special PET identity is being lost. We think it is a small price to pay for the extra flexibility and choice.

Special Delivery: THE ELECTRONIC LETTER.

Ask any one in the microcomputer industry what the next big market will be, and you will get a one word answer: communications. But ask them to define what that generic term covers and they probably won't be able to tell you. Communications - in crude terms: transferring data from A to B whether by wire, telephone or even satelite - is an esoteric subject, and those who have fathomed its depths, seem determined to keep it that way. After all, the more the public knows about interfaces, the less the the suppliers can charge for their electronic wonder boxes.

The corollary is that the average businessman or even micro-enthusiast is so uninformed or even afraid of communications that the collective imagination is not applied to the development of new applications. And that is a bad thing for everyone - because leaving everything to the specialists usually results in some pretty dreary ideas - like the Intelligent Terminal.

Now to be fair, we should devote a little more space to this device, since it is a small step forward from the Dumb Terminal! A large mainframe computer can service many users at once by means of a number of terminals. Developed from the original Teletype, the terminal simply sends characters from the keyboard to the computer, receives them from the computer, and displays them on its screen or VDU. Two problems arise: if you change your computer then the chances are you will have to change all the terminals, since many manufacturers, including IBM, do not use standards that encourage mix'n match. Secondly, no matter how simple the task - such as keying in someone's name - you are on-line to the computer constantly. That means you are blocking someone else out and, if you are some distance from the computer, suffering high telephone charges to boot. The Intelligent Terminal will, at the very least, allow you to edit a whole screenful of information, before sending the final version "down-the-line".

If you use a microcomputer to imitate or 'emulate' an intelligent terminal you can then go one stage further. Typically, the user might download some information he requires from the mainframe computer to his local floppy disk, then process or inspect it before reconnecting and returning the revised data to the central database.

The microcomputer needs the right interface to do this (a full report on interfaces appeared in the June issue of *Printout*). That apart, it is the software that does the job. Change your mainframe and all you need do is insert a new disk! Using a microcomputer such as the PET or Apple works out at about half the cost of a dedicated terminal from the system manufacturer. Say, a little less than £3,000 compared with around £6,000.

Pleasing as it is that the micro can save money in this way, it is only applicable to situations where a mainframe is already in use. And when you recall that the arrival of the microcomputer was to have signalled the demise of the mainframe-to-terminal configuration. it all seems somehow ironic that micros should be used merely to replace terminals.

The real future lies in a micro-to-micro communication - sending information from one office to another, or from home to home. The limiting factor has so far been a lack of applications software to allow this - unless you understand enough about Baud Rates and Bit Rates (yes, there is a difference!) to write your own using a standard utility package such as Comlink.

Two recent developments are encouraging. *Silicon Office* is a superb new piece of software shortly to be launched by Bristol Software - an uprated version of OZZ, about which we have enthused in the past (*Printout* January '81). It comprises four main elements, which Bristol say cover the principal aspects of business communication. There's an information retrieval system for storing records according to a layout designed by the user. A high precision calculator can accumulate data from these records or perform forecasting/accounting. The built-in word processor can be used for simple letters and reports, or to produce summaries of the records.

Finally, the Communicator can send any piece of information - be it a calculated total, screen format, letter, or even a complete database - to any other *Silicon Office* user. Using no more hardware than a PET and Commodore modem (8010) the procedure is completely 'transparent' to the user who simply presses a button. It is not necessary, Bristol claim, to know a single word of communications jargon.

A second welcome arrival is the *Bulletin Board* system, demonstrated to us by Commodore's new Communications Manager, Rod Wellburn. Rodney describes himself as a specialist 'trying to make good' by learning marketing! The electronic *Bulletin Board* is aptly named since it is used as a means of posting up messages and notices for others to read - with their micros. Somewhere, there is a central computer which holds all the information - we tried out one called FORUM-80 run during off-peak telephone hours by a Mr. Fred Brown. Interested users can contact him on 0482-859169.

Each user/subscriber starts with a micro running a *Bulletin Board* software package. Almost any micro will do since the software is now virtually standard, thanks to the large number of such facilities in the States. The program we tried out was called ORION and is a US import that Commodore will shortly be selling here. The user can "pin" any type of message on the "board" - for public consumption, or for a particular individual who knows your special password.

As a receiver, the user will be advised of what messages are current - and what are waiting for him specifically. The text may then be transmitted onto his screen, to the printer or even direct to disk to be read later. Because previously prepared files can be transferred at the touch of a key, real electronic mail becomes possible. A typical application might be for transmission of documents between different offices of one company.

For micro enthusiasts, however, the big event is public domain software. We successfully loaded a 16K BASIC program onto our computer from the telephone.

This is how the communications market should be developing - moving slowly but surely towards full electronic mail. If you have tried out such a system, would like to know more, or have strong views on this type of application, then write and let us know. *Printout* will be following this development in detail over the next few months, and reviewing *ORION, Silicon Office* and other packages as they appear.

AMAZING FACTS & FALACIES

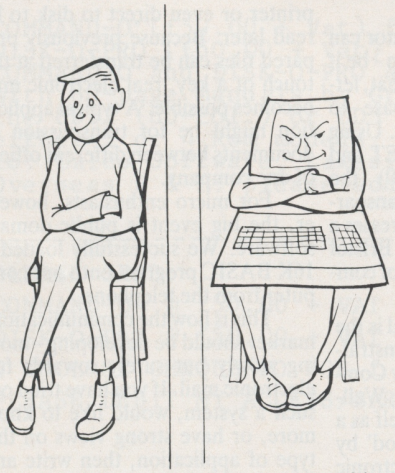
Electricity is too slow

Most people know that electricty travels at the speed of light - 186,000 miles per second. Fast as that seems, it is already becoming a major restriction for the designer of the modern microcomputer. An electrical pulse can take longer to travel along a connecting wire than the 'Cycle Time' of the computer - so that the processor ends up being very confused! The fastest contemporary mainframe computer - the CRAY 1 - is constructed in the form of a ring so that no connecting wire is more than one metre long! The Josephson Junction computer, however, now being designed for use in the 1990's, is so unbelievably fast that the entire works must be contained within a one inch cube! Because it makes use of 'Superconductivity', temperatures of less than -270°C are needed. So although the entire computer consumes only 15 Watts of power (less than a small domestic light bulb), it must be constantly serviced by more than 60,000 Watts of cooling equipment!

Computers can't think

Anthropomorphism, according to the Oxford English Dictionary, is the attribution of human characteristics to animals or inanimate objects. It is a trait often found amongst programmers who frequently described their computers as "intelligent", "friendly", or on a bad day, "bloody minded" or "stupid". And of course *everyone* knows that computers can't really think or understand. Or can they?

Most criteria for deciding whether a machine is truly intelligent or not are extremely clumsy and could easily be fooled by contemporary technology. However, the one test now universally accepted is the Turing Test, published by Alan Turing in a thesis which has become an essential reference for computer designers. In this test, a man and a computer are put in separate rooms, each "conversing" with a third person by means of



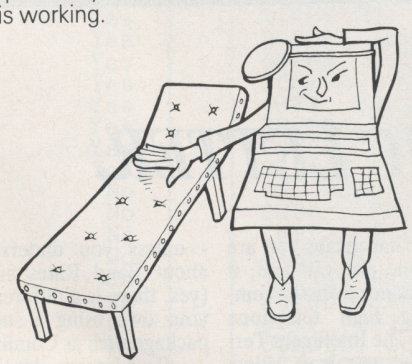
a teletype. Both attempt to convince him that they are human. If the subject is unable to identify the man consistently, then the machine under test could safely be described as "intelligent".

It is true that no machine has yet passed this test, but there is no longer any valid theoretical reason why one could not, thanks to improvements in Artificial Intelligence software.

A number of low cost programs for microcomputers *appear* to do this. The best known of these is called ELIZA, in which the computer attempts to simulate a psychiatrist and get you to divulge your innermost problems. Typical conversation:

Hello, I'm Eliza: what is your problem?
I hate all computers
Why do you hate computers?
You are all the same - overpowering.
We were discussing you - not me.

This program, however, is unsophisticated, and after a half-hour conversation, it is quite easy to understand the way in which it is working.



Computers can speak

Until recently synthesised speech has tended to sound like a Dalek with a Swedish accent. That is about to change with the release of Texas Instruments' new 'Text-to-Speech' system which will convert text directly into synthesised speech. Votrax have a similar system. To the computer, the synthesiser looks like any other peripheral so instead of sending text to a printer, the computer sends it to the synthesiser which translates it into speech. Incoming words are scanned letter-by-letter for phonetic combinations the system has been programmed to recognise. If the syllable is not yet recognised, the unit follows a set of pronounciation rules, inserting special codes which instruct the synthesiser to vary the pitch of the sounds. The result is synthesised speech that sounds more human and is easier to understand.

Keyboard is the only input

While for years computers have been able to manipulate information and store it on magnetic tape, disk or paper tape, the bottleneck has always been the feeding in of the data. The belief that the keyboard is the only such method has prevented many businesses from computerising - both because it is slow and (all too frequently) because managers view the idea of typing with scorn.

But now considerable research is under way to enable computers to accept information in a more direct form. Here are some methods that already exist:

Speech recognition is a technique that can accept human conversation from a microphone by "digitising" the sound into discrete lumps and comparing the pattern with its phonetic dictionary to find the best match. Current versions will typically recognise 20 different words spoken by anybody - or 1000 words by a 'known' trained speaker. Such systems are used in warehouses to record package numbers where a keyboard would be impractical.

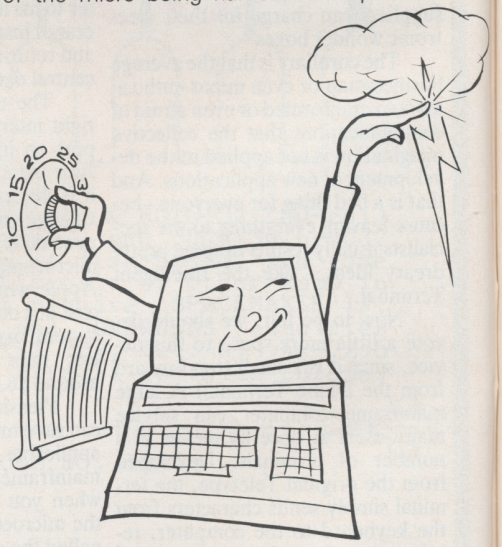
Handwriting can now be accepted by means of a new device called MicroPad - a pressure sensitive surface over which the user places his sheet of paper - anything from a stock sheet to telex request form. Upper case or numeric characters written on the sheet in ballpen are then interpreted by the inbuilt microprocessor, shown on a one-line character display for checking, and then sent to the computer. The unit is physically unobtrusive on the desk, and remarkably tolerant of different sizes and styles of writing.

Printed characters can be read in using an Optical Character Reader. This is a type of electronic pen, passed over the lines of text. Because typewritten characters are fairly uniform, the software to recognise the letters is unsophisticated. Simple OCR's are now used in some supermarket checkout queues to read the price tags into the cash register.

Computers are used to Control the Home

One of the dangers of modern mass communication is that once an idea is mentioned without being challenged, it becomes an accepted fact. Take the concept of computers controlling the home, for example.

The *idea* is great - the processing power of the micro being harnessed to plan the most economical heating programme with much monitoring of temperature, humidity, windspeed and so on. However, we have been unable to unearth a single instance of a microcomputer user controlling his home environment in this way.



There are two probable causes: the software and the hardware. Nobody wants to buy a domestic microcomputer only to find that they cannot play Space Invaders because the

device is constantly tied up 24 hours a day controlling the heating. In fact, it is fairly easy to overcome this using a software technique called background processing.

If a particular process is slow-moving (as in the case of home temperature where variables rarely change significantly in one minute), then it is possible to process it in the "background" of the computer in such a way that the user can be totally unaware of its existance and is free to perform other tasks in the "foreground". The newcomer to the PET, for example, is unaware that 60 times every second his program is temporarily interrupted so that PET can attend to various internal "housekeeping" functions such as testing the keyboard.

Then there is the hardware problem. Most houses just aren't wired for computerisation. Instead of one central thermostat, if the job is to be done properly, a minute temperature transducer is needed in each room. These have to be connected together - passing electrically noisy things like mains cables. Instead of turning the boiler on and off, it is the individual radiators that need controlling - and that means servo valves - the list goes on.

Small wonder then, that the home environment remains uncontrolled.

More haste less speed.

With computers getting so fast that it is possible to add two numbers in a millioneth of a second, you might think there is no real task that could not be 'turned round' almost instantaneously.

No so. Take the classic case of inverting a matrix. A matrix is simply a square of numbers used by engineers to design circuits and bridges, and inverting it involves nothing more complex than additions and multiplications - many, many times over. The time the process takes depends on the "algorithm" you use - simply the order in which those functions are chosen.

The most classic algorithm is given to programming students to invert a matrix of 9 numbers (3x3) and is quite satisfactory. Apply that to a 15x15 matrix, however, and a contemporary computer would take *six million years to finish!* Go further to 20x20 (which is still not large in engineering terms) and you would need several times the estimated age of the universe!

If this seems a trifle slow, let us hasten to add that there are alternative algorithms which could do the same job in a fraction of a second. The example does emphasise, however, that no matter how fast your machine, you still need to pay very careful attention to the efficiency of your program.

The miniature brain

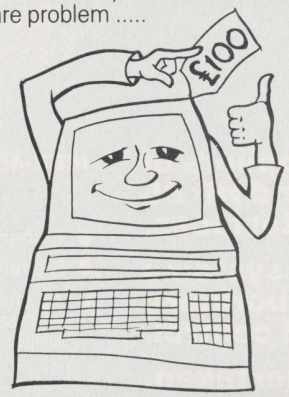
This phrase is often used by advertising men, to describe some relatively simple circuit. But if we really could build a computer as sophisticated as the human brain - just how big would it be?

The brain contains some ten thousand million basic units called neurons. Nobody knows quite what a neuron can do - though some have postulated that it is the equivalent of a BIT - the most elementary computer building block.

Working from that assumption, it was calculated that an electronic brain would be the size of the Empire State Building, but would need the waters of the Pacific Ocean to cool it.

That calculation was based on the transistor technology of the time. With the introduction of the silicon chip and subsequent increase in bits per cubic centimetre, it would now be possible to make 'The Brain' smaller than its natural counterpart!

Unfortunately, it would be impossible to connect it up, since the thin gold wires now used are too bulky. And there would be the software problem .....



The human touch

Far from being the technological black boxes they once were, microcomputers are now becoming much more friendly in operation. It would surprise most people to learn that nowadays as much time is spent on the external design as on the internal workings. There is a whole new science to cope with this - called Ergonomics.

Getting the slope of the keyboard or the viewing angle of the screen just right to minimize operator strain, is so tricky that many companies are now opting for the physically adjustable approach. Some forward-thinking countries like Sweden have already laid down standards: specifying, for example, that the keyboard be detachable and the screen luminescence a certain colour.

Software, too, has its own ergonomics - usually referred to as "user-friendliness" - to make the operation of a program as acceptable as possible to the untrained user.

It may take the form of routines to check that the date entered is a valid one. More subtle is the way in which information is laid out on the screen for most rapid perception, or the most logical order of entries when specifying a business transaction.

Ironically, one of the most sophisticated design tools available to the ergonomist is a complex model of the human body to work out best sitting positions and lines of sight. This model is, of course, implemented on a highly technical computer system!

Computers can spell

One of the fastest growing applications of microcomputers is word processing. Designed to replace the typewriter, these systems enable the user to create and edit text on the display screen, before committing the final version to print. Apart from saving time in correcting typing mistakes, a word processor also permits standard letters to be sent to a large number of recipients - automatically addressed and 'personalised'. The latest and most sophisticated versions can even detect and alert the operator to any spelling mistakes, using a 25,000 word dictionary or complex spelling algorithm!

Ironically the results are often too perfect to be human and one company is now working on a routine to insert random spelling errors.

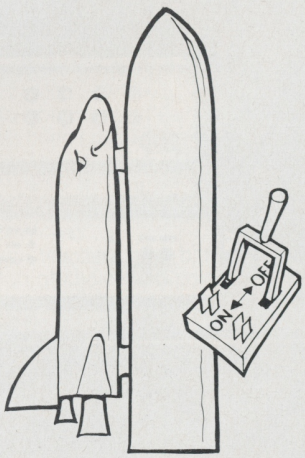
Mistakes can happen

Most of the so-called Computer Errors which hit the headlines are in fact Operator Errors - even though tracing the sequence of events is sometimes nearly impossible. However, computers can and do make their own mistakes: these are called Bit Errors. A Bit (or Binary digIT) is the smallest element in a computer system, and can store either a '1' or a '0'. Sometimes these Bits can randomly flip over from one state to the other giving a Bit Error. This has a variety of causes, such as minor flaws in the silicon crystal components, changes in operating temperature, electrical interference from nearby machinery, or even unusually high sunspot activity. Though the errors themselves are small, the consequences can be catastrophic, so attempts are made to detect such errors as they occur. Extra Bits are built into the system to serve as checks on the others. In systems where reliability is critical - such as Medical or Military applications, most such errors can actually be corrected automatically using a system called Hamming Codes. In these systems it is possible to remove any one of the chips for testing or replacement *without interrupting the operation of the processor!*

The computer company Tandem took this process one stage further by duplicating every component in the system, running them in 'tandem', and comparing the results after each operation.

An interesting aside to this concerns the Space Shuttle which, after two years of teething troubles, was finally launched two days late - because of computer errors. What actually happened was this: the three main computers running in parallel for safety checks were slightly out of synchronisation. This meant that messages being passed between them were arriving a millioneth of a second too early or too late.

After careful deliberation by the software scientists, the best solution was found to be *switching the whole system off and then on again!*



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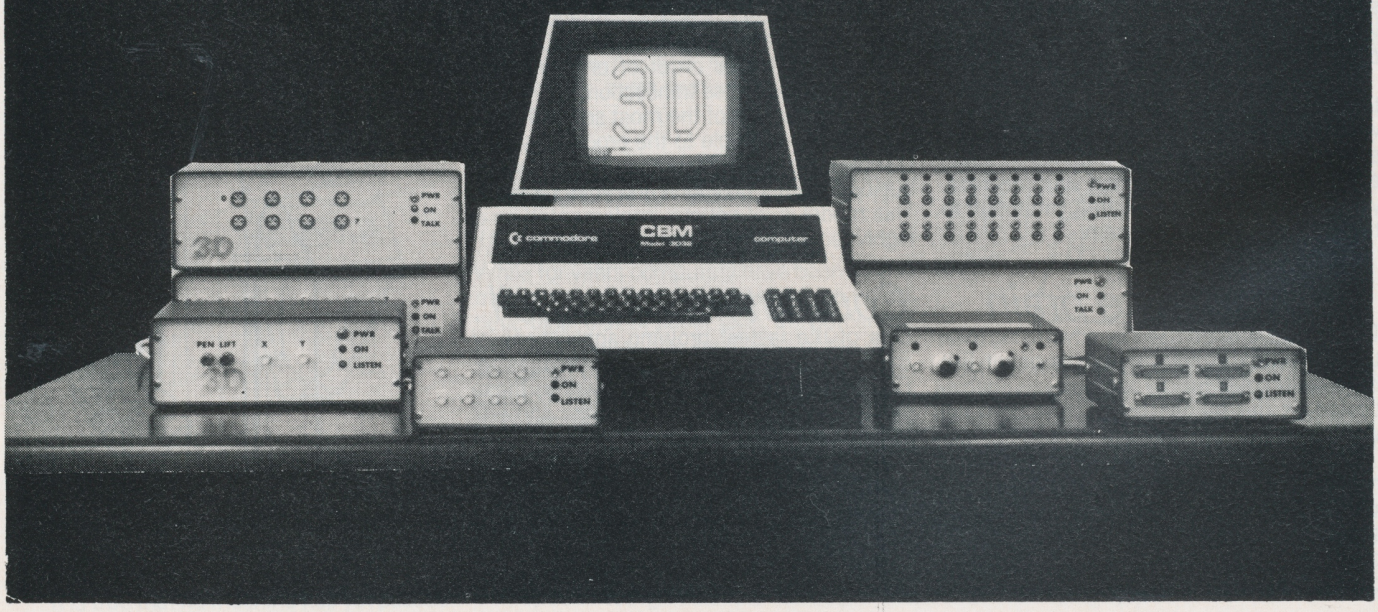
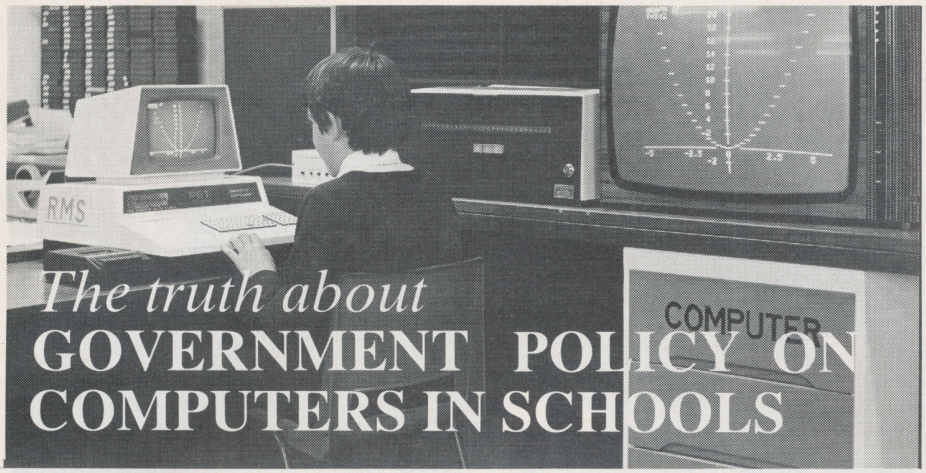




The truth about GOVERNMENT POLICY ON COMPUTERS IN SCHOOLS

After four years of pressure from schools and education authorities, the Government has finally come out with its policy on financial aid for schools buying microcomputers. The announcement attracted widespread criticism from educators and microcomputer manufacturers alike. *Printout* spoke to the principal characters in the drama.

Central to the now-raging controversy over the use of microcomputers in schools are the three schemes which the Government has backed with cash.

The first of these is the *Microprocessor Application Project* (MAP), the aim of which is to help set up new courses or application laboratories with a view to increasing the level of awareness of microelectronics in both Education and Industry. Funding of up to 50% of the initial set-up costs is available, the allocations being adjudicated by the Manchester-based National Computing Centre. This scheme is due to run for another year.

The *Microelectronics in Education Programme* is more specifically applicable to schools since it is concerned with the development of new curricula to take account of the new technology. It also aims to cover the area of teacher training - although the idea has had a somewhat mixed reception. While some schools welcome a facility whereby they can send their staff for training, others (in particular those which have already recognised and installed the microcomputer) complain that it is too restrictive in its approach. The project budget of £9m - under the control of Richard Fothergill in Newcastle - is however, seen as being a step in the right direction.

The policy over which the real storm has arisen is the Department of Industry's scheme to pay half the cost of microcomputers installed in schools. The catch is that the rebate applies only to schools purchasing from now onwards. Furthermore, it only applies to *two* microcomputers - the Research Machines 380Z and a new low-cost machine from Acorn. Apart from the obvious restriction in having only two eligble models to choose from, most experts say that the DoI has chosen the *wrong* two machines.

The Chosen Ones

Both are British. The 380Z has been around for nearly four years - and has gained wide acceptance in the education market. 'Wide' seems in this case to refer to geographical rather than numerical distribution. The Inner London Education Authority has for some time run a related scheme of financial aid based on the 380Z. Hertfordshire have opted for it, too - to the tune of a £5m programme.

In its favour, it must be said that the 380Z is a proven machine, robust enough for the classroom, and with some excellent software packages available for it. Support, which is critically important in education, is generally good. Some Authorities have set up their own service and training centres.

On the other hand, during its four-year history, the 380Z has had to weather a steady stream of niggling complaints from users - and many teachers consider it to be past its prime - "coming up for retirement age" one of them commented. Though it is based on the Z-80 processor, the version of CP/M supported is now obsolete, and the disk drives incorporated have capacity of only 114K bytes each - low by today's standards. At a price of £1680 plus VAT, the 380Z is the DoI's "upper level" machine choice.

Cheap and Cheerful

The favoured "low end" model is the one designed by Acorn for the BBC microcomputer project, which almost certainly accounts for the DoI's decision. The specification is quite remarkable for the £260 it will cost. It includes high resolution graphics, colour, 16K RAM, 32K ROM, and an operating system that can cope with disks, cassettes, and networking between several stations. There will be options for either domestic T.V. or monitor, and subsequently versions capable of accessing Prestel and Teletext.

The problem is that the specification includes so much. Officially, deliveries are scheduled to commence this Autumn. However, there has been speculation that the Acorn Proton, as it is known, may not be around in time for the T.V. series it is meant to support, and that viewers may have to make do with little brother - the Acorn Atom.

Some teachers have bitterly resented this restriction of choice and point out that even if the British-made flag is a requiement, there are still ten other indigenous manufacturers to choose from. Many of these have adopted the more standard 64K RAM, S100 Bus design. A recent survey by *Educational Computing* showed that of the schools who possess a microcomputer, no less than 51 percent had opted for the Commodore PET, and would contrive to do so given the choice. This was often despite, not

ROBIN BRADBEER - Consulting Editor of Educational Computing

"What the Government's decision boils down to is that schools are being given the choice of a machine that nobody wants, and one that doesn't exist! Schools which bought other microcomputers before this directive are now being penalised for their initiative, and many new schools will find the pre-requisite of sending two teachers on the training program difficult to meet."

BOB GLEADOW - General Manager, Commodore U.K.

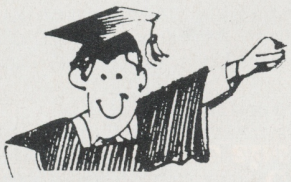
"Britain has traditionally been the best software producer in the world - even the Americans will admit that - but now we are losing this lead because the Government has failed to recognise the importance of software. Within ten years the software will constitute 80% of the cost of a microcomputer system, and that's a lot of revenue. Look at the VisiCalc package which is believed to be responsible for 20% of the sales of all microcomputers, worldwide.

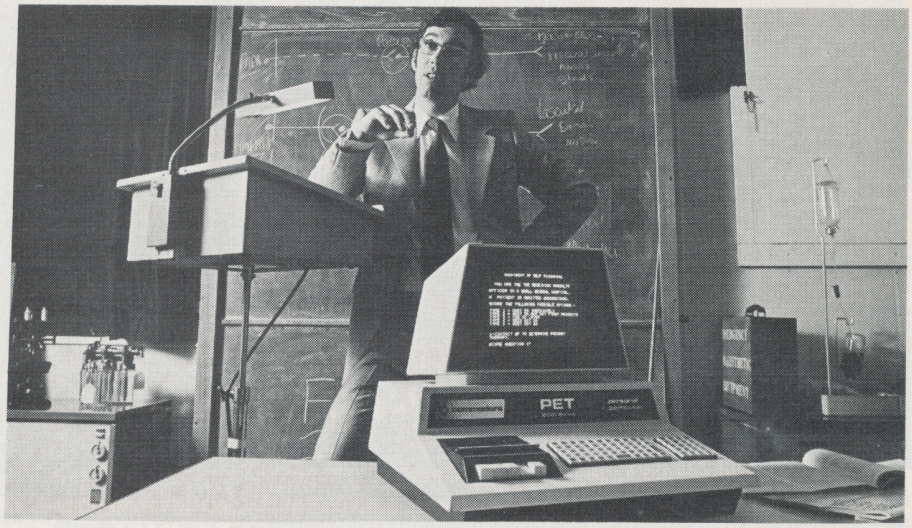
The Government should have opted for a machine that is internationally viable and available. They should then direct and encourage the development of software for that machine and export the results.

The present policy is just ludicrous. The idea of supporting an all-British microcomputer is commendable, yet the two favoured models are little more than British assemblies of American or Japanese components - where's the honour in that?

If the Government really is committed to establishing a British hardware capability, then it should pump finance in at the design and component level. Let's have a strong British microprocessor - not some anachronistic 16K static RAM, which is all that NEB-backed INMOS are working on right now. Why export a train that won't run on anyone else's track?"

because of local education authority policy. In Surrey, for example, the LEA has firmly recommended the Research Machines 380Z. Of 25 West Surrey schools:- two opted for the 380Z, two for Apple, two for the Acorn Atom, and 46 for PET. *Printout's* own research indicates that nationwide - not just in schools - there are *ten* times the number of PETs to 380Zs - 49,000 compared with less than 4,800.





MIKE BAWTREE -
Head of Computing,
Royal Grammar School,
Guildford.

"It is alleged that between one half and three quarters of all schools in the country do not have a microcomputer yet. The most probable reason for that is that the individual Headmaster is either not keen, not under any pressure, or hasn't enough funds at his disposal.
Given that, he is unlikely to opt for the 380Z - rather for the Acorn machine, which has zero proven track records in schools or anywhere else.
Our own school has already purchased half a dozen PETs which means we are inelligible for the grant. Yet we must purchase at least one of these (at full price) if we are to keep up to date with the development of microcomputers in schools. We wish to support Richard Fothergill and his MEP programme, but it is costing us dear to do so."

COULD A MICRO HAVE CAUGHT THE RIPPER?

by Julian Allason and Richard Pawson

Police officers investigating the Yorkshire Ripper murders now privately admit that the enquiry was seriously hindered by their inability to cope with the vast amount of information generated. "We became bogged down" said one. Other detectives believe the Ripper would have been caught sooner if certain vital information had not been overlooked.

So why didn't they use a computer? The answer is that attempts were made to harness the Police National Computer at Hendon and the Drivers and Vehicle Licensing Centre's computer at Swansea. These were found to be unsuitable, and the idea was discarded. But could the investigation not have benefitted from the use of even an inexpensive personal computer?

By the latter part of the investigation the names of some two hundred main suspects had emerged, including that of Sutcliffe himself. Many thousands of man hours were then spent sorting through index cards attempting to match known characteristics of the Ripper against those of the suspects.

Although this is precisely the sort of application at which computers excel, the police are believed to have been advised that a special program might take nine months to develop and debug.

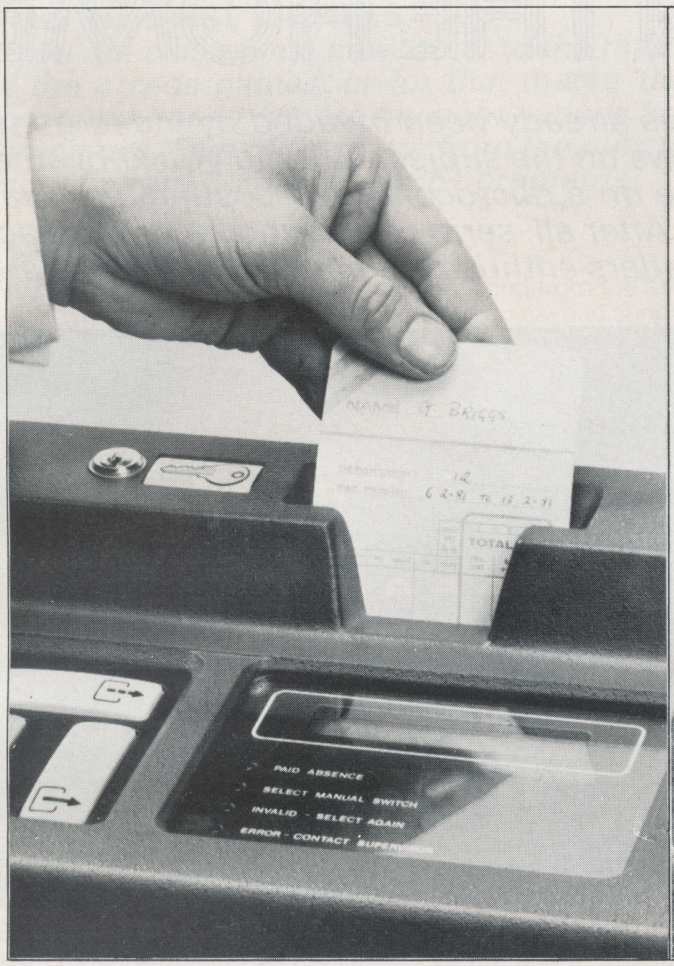
Yet there are several "configurable" packages available off-the-shelf that would have allowed a computer replacement for the card index system to be set up in **less than one hour.** Programs like *OZZ, Petaid* and *DMS* for PET, or Personal Software's *CCA Data Management System* for Apple would all have been suitable.

Files incorporating details of each suspect and their characteristics would be created on screen. Any additions or amendments could be made with a few key presses. Instead of having to laboriously search through trays of cards, the search criteria would be fed straight to the program. The operator could then request a list of all suspects in a certain age group, with beards, the ability to travel, with previous records of assault, etc. The time taken to produce these records on the screen would be seconds.

A SuperPET with 32K of RAM and a one megabyte floppy disk drive might have offered sufficient capacity to store and process the suspect list at a cost of less than £1800. If more storage had been required an Apple II with Corvus hard disk would have provided 11 megabytes on line. As an indication of the speed with which such a system can be set up, it is worth recalling the fire-disaster at the MGM Grand Hotel in Las Vegas last January.

In a matter of hours, Commodore who were exhibiting at a trade show there, were able to set up seven complete microcomputer systems with a specially adapted program for disaster aid. This was used to trace the thousands of guests staying at the Hotel, with new information and calls from anxious relatives being handled every few seconds.

That situation lasted only three days and the Police afterwards acknowledged the tremendous contribution made by the microcomputers. Surely, in the thousands of man-years that went into the Ripper investigation, this could have been considered?



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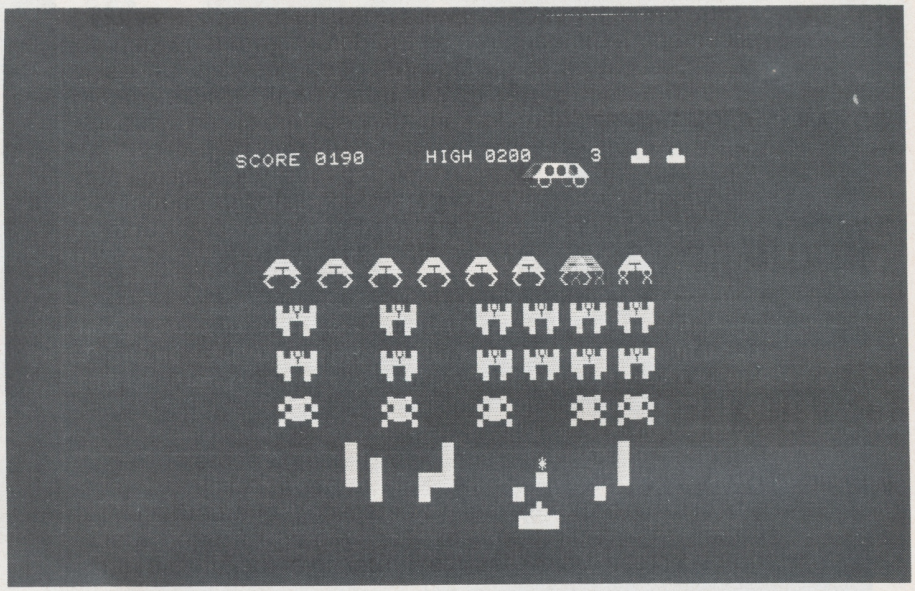
INVADERS IN THE HOME

The chances are that your local pub has already been invaded by video game machines and that you hold strong views on the subject. But did you know that all these games can be played at home on a microcomputer costing less than £200? Isn't that where they should be? After all, serious drinking calls for peace and quiet. Real Ale and Real Space Invaders enthusiast ***Pete Gerrard,*** *reports.*



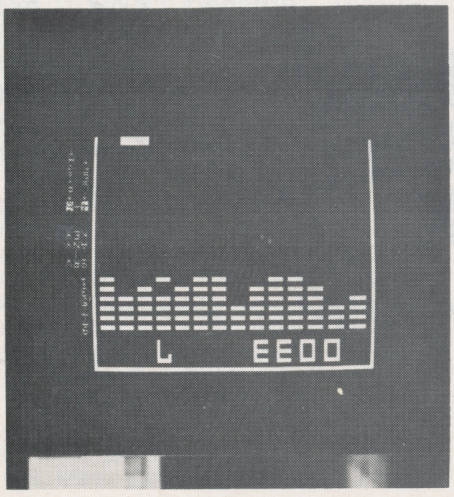
Even as far back as Egyptian times people have played games, whether simple ones with dice or stones, or more exotic pastimes with cards and boards. In the last few years a whole new and extremely lucrative market has developed with the arrival of the Video Game - bane of the man who yearns for a quiet pint.

When they first arrived as a simple plug-into-your-television games, people spent hours into the night forsaking Parkinson and Sir Robin for the delights of batting a blob across the screen and hitting it back again. Tanks fired bullets - and then (my God, how did they do it ?!) bullets that bent! Men jumped out of parachutes and fought against the prevailing wind to land safely. Walls shattered as a variety of white blobs fired at them.

Then the machines, simple at first, invaded the pubs of the land and the first bleeps and burbles began to annoy the regulars. People re-discovered the ten pence piece (never referred to as two bob - who would admit to paying four shillings for a game? Or for that matter thirteen shillings for a pint?) But all this was quiet stuff compared with the revolution to come; for with the arrival of the first *Invaders* machine, everything changed.

Space Invaders, for the benefit of those of you who've spent the last five years in a nuclear fallout shelter, is a deceptively simple game. A number of rows of 'aliens' descend from the heavens, and merrily march across the screen, getting lower with each pass. The cads fire missiles at your ship as you patrol the ground in a vain attempt to save the world. All you've got to do is fire missiles back at these invaders, and kill them off. A number of shelters you can hide behind, and that's it. Simple isn't? But who would have thought that a game like this, a game which you can never win, would have the revolutionary effect that it did.

Space Invaders started the rush of games that followed. Reports abounded about *Invaders* - scores of over one hundred thousand, one million, and surely the ultimate, a story from Canada of one young man who scored SEVEN MILLION points in twelve hours. He subsequently collapsed and was taken to hospital - which only goes to prove that the *Invaders* always win! There are even the world championships for the game. But, you can't win! And you spend a fortune in ten pence pieces (and on beer to counteract your increasing frustration).



For a long time *Invaders* remained the leader in the field - consistently outlasting the ephemeral popularity of rival games. The first real challenge came from *Galaxian* (also launched under a variety of names). This used the same format as *Invaders,* but with one important difference - they came down the screen in ones, twos and threes in kamikaze missions, attacking your ship with a hail of bullets. This became increasingly popular, and for the first time since *Invaders,* I saw people leaping up and down in pubs as they played the game.

Machine followed machine - growing in sophistication and graphic ingenuity. But the manufacturers were beginning to flog the idea to death, competing with each other to squeeze ever new permutations out of the same basic parameters. There is, however, a limit to what can be done in this area. No matter how clever the graphics got, the idea behind all the games was the same - you control a spaceship, and you've got to destroy the aliens before they destroy you. (Mind you, even if you do, they'll always reappear again). So there came a sudden rush of new, 'MAD' games - games where you controlled little men, rather than spaceships - games where you climbed up the side of skyscrapers rather than sailing boldly through space. Even games that talk at you - particularly maddening in a quiet local.

Now the interesting thing is that a video game machine is nothing more than a dedicated microcomputer - a processor (usually the 6502 which is the same as is used on PET and Apple) some RAM, ROM and a screen. So it wasn't long before micro computers began to follow the same sort of pattern as the arcade machines in pubs; simple games at first, getting more sophisticated as time went by. The PET version of *Invaders*, for example, proved to be enormously popular, being Commodore's biggest selling cassette program. And with a home computer, when you want a new game, all that changes is the software - purchased on cassette or disk. True, you haven't got such sophisticated hardware in terms of high-resolution graphics or 'throttle' type hand controls, but that's not to say that the microcomputer is without advantages as a games machine. For a basic 8K PET, at £425.00 (or 2,125 games of *Invaders*!), there is a vast number of games available, and you're not limited to opening hours. There's always your local off-license....

Many of the games available, whilst lacking the spectacular graphics of the pub machines, nonetheless have a similar addictive quality, and function along the same simple lines: you control the ship; you fire at the aliens. Some of the later arrivals, Commodore's *Cosmiads*, for example, make valient attempts to employ the graphics available; and in this particular instance they succeeded very well. And when you think about it, if you go into the pub, say, six times a week and play an average of five games each time you go in there, in just over a year you could have bought yourself a PET. You can't play Crazy

The 10 Best Games

If you are a complete newcomer to the magical land of the arcade games, or for that matter the microcomputer, then here are my nominations for the top ten games. Five of them are from the pub, while the other five are Commodore PET programs.

Down the Pub:

INVADERS Rows of animated aliens descend from the sky, dropping missiles on your rocket base. You have to shoot the lot before they get to earth.

GALAXIAN Derivation of invaders - this time in colour, and with special attack squadrons splitting off to dive-bomb you.

ASTEROIDS No aliens, only different sized masses of rock hurtling randomly across the screen. Your (movable) rocket ship must either destroy them or, at worst, evade them. Novel panic button called "Hyperspace" for emergencies.

MISSILE COMMAND You have 3 bases this time with which to defend your earthly city. Apparently very difficult, a score of 20,000 is considered good.

CRAZY CLIMBER Still in its infancy and quite rare in pubs, this is rather more original. A little man climbs up the *outside* of a skyscraper, trying to negotiate various obstacles. These include: opening windows, King Kong and bird droppings!

On the PET

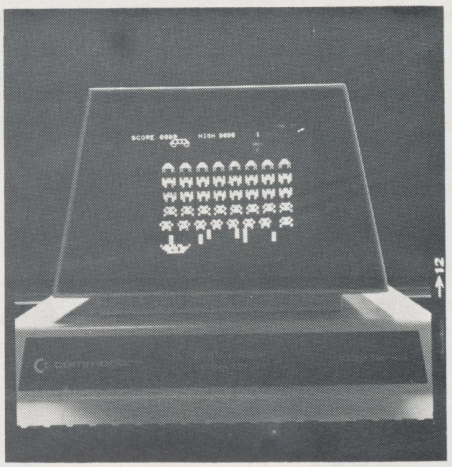
INVADERS Very good implementation, though with a lower screen resolution. The keys A, 4 & 6 are used to provide controls so they tend to get very worn down. Sound is included if you can add a small speaker to the back of your PET.

COSMIC JAILBREAK Also derived from Invaders, the aliens approach from both sides to free their reinforcements from a cosmic jail in the centre of the screen. Good because the freed aliens add extra variables to the game. Reputedly tied up Commodore's entire software department for six weeks - for "user testing"!

COSMIADS Commodore version of Galaxian

CAR RACE You drive up the centre of the screen, trying to avoid on coming vehicles by some adept steering.

BREAKOUT Based on arcade game of the same name - the idea being to break down a wall of bricks by batting blobs against it. More fun than it sounds!



Climber (or whatever your current fave rave is) on a PET? Wait and see what the VIC will offer.

Working the same pub and arcade game playing times as before, you could buy yourself a VIC in about 7 months, and on that you'll certainly be able to play these type of games. High resolution graphics, sound, full colour - what more could a person want?

So what does the future hold? There will certainly be something of a race between the various arcade machine makers to produce the 'ultimate' in game. The latest games seem to be veering away from the space games towards skyscraper climbing, alien eating, chasing aliens up and down ladders and digging holes for them to fall into. And now the machines are beginning to talk to you. Happily there appears to be a trend towards removing the machines from pubs to amusement arcades where they belong.

To Our Readers.....

Personal computing should be fun. Whether you use your machine for business, at school, or at home, there is no doubt that a microcomputer is a highly personal possession.

Even if you are not an enthusiast, or have yet to buy, you almost certainly want to learn more about computing. And there is no doubt that to be really effective, your source of information needs to be as personal as your computer.

Microcomputer Printout is written for you by experts in the field, each of whom still enjoys computing enough to want to pass on their own enthusiasm to newcomers. The only way to do that is by writing in English instead of computer jargon.

Microcomputer Printout started eighteen months ago as the authoritative voice specialising in Britain's best-selling microcomputer, the Commodore PET. These days the PET is still number one with nearly 50,000 in use. We will be continuing to feature the PET as our key machine, with software reviews, programming articles, and the popular technical queries section.

But flicking through the pages, you will notice something else; the number of articles written - in English - for the beginner, be he novice computer owner or prospective purchaser of any low-cost microcomputer.

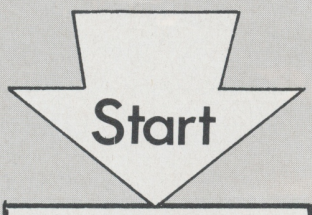
Judging by the many letters we receive, it is clear that both groups of readers can benefit enormously from each other. PET users will welcome the wealth of information relevant to their system and the non-technical teaching approach we have adopted. The newcomers gain an introduction to microcomputing that is also illustrated by reference to the most widely used system and the most widely accepted computer language *Microsoft BASIC*.

Unlike other magazines which cater only for enthusiasts with highly technical hardware reviews and complex techniques, *Microcomputer Printout* looks at everything. That can mean reporting on new applications, testing different software packages, explaining programming methods, as well as regularly unleashing the newshounds to tell you what is *really* going on in the world of computing.

We hope you will stay with us. If you do we can promise you three things. *Microcomputer Printout* will be informative, written in *English,* and above all *fun.*

THE GREAT CO

or How to Choose



The business of buying a micro has been likened to a game of chance. Choosing the right one calls for some skill - and lots of luck.

To assist you our team of experts has evolved a scientific simulation of the whole buying process. This way you can make your mistakes *before you buy!*

All you will need are dice and four counters. Players start by drawing to see who will start with each of the following machines: Atari 400, Commodore VIC, Tandy TRS-80 Colour, and Sinclair ZX-81.

Each player throws the dice in turn, moving his counter forward the number of squares indicated on the dice. He *and the other players* (where appropriate) must obey the instructions on the square upon which he lands.

Freddie Laker promotes your machine. Forward 1 1	Manual "nearly ready"; wait here until you throw a six 2	Commodore issue new ROM set. VIC back one. 3	Sinclair releases £10 printer. ZX-81 forward two. 4	You are revealed as Inside Trader's source. Miss a turn while wounds heal. 5	Your programs pirated. Back one. 6	Good review in *Printout*. Throw again. 7	Secure rights to saucy *Interlude* program. Forward 2 8
Invitated to *Practical Computing's* party. Miss turn to recover from food poisoning. 12	Need upper & lower case on screen. VIC & Atari jump one ahead. Rest back one. 11	*Interlude* denounced by Mrs Whitehouse. Ahead four squares. 10	Warner Bros in takeover bid by Mafia. Atari back 1. 9				
Do de l wi Comm dor Ahead thre 13	The four inex pens inc. VAT soon to-b likel tha A *Prin out* use nd e shor y.						

OMPUTER RACE

se a Cheap Micro

Do deal with Commodore. Ahead three.	Buy IBM mainframe. Disqualified ! 14	Commodore renege on deal. Back four. 15	RAM chip goes. Throw a six for a replacement. 16	Kit Spencer returns to UK. VIC back four. 17

The four principal contenders in the race to dominate the market for inexpensive personal computers are the mail-order only **Sinclair ZX-81**(£69.95 inc. VAT), Commodore's new **VIC** colour machine (£189.95 inc. VAT), and the soon-to-be-launched **Atari 400** and the Tandy **TRS-80 Colour** computer. It is likely that these will be priced at around £345 and £299 plus VAT respectively.

A full review of the VIC appeared in the June issue of *Microcomputer Printout* (copies of which are available price £1 post free). We found it easy-to-use and excellent value. Reports on the competing machines will be appearing shortly.

18

Clive Sinclair launches ZX-82. Sinclair owners curse and sit still for two turns. 22	Bug in operating system. Back to square one. 21	HiFi on blink. Resort to computer music. VIC, Atari ahead 3; TRS-80 ahead 1; Sinclair back one. 20	22 columns not enough. VIC back one. 19
Processor speed boosts you ahead: VIC, TRS-80 by 1, Atari 2, Sinclair 3. 23			
Zapped by Space Invaders. Back four. 24	Telephone call from John Chew. Miss two turns. 25	Develop Arthritis in fingers. Small keyboards useless. Sinclair & Atari move back one. 26	**THE RIGHT CHOICE!** 27

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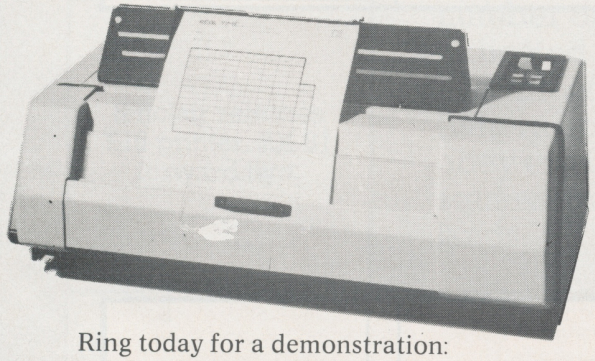

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What the Salesman *Won't* Tell You!

Computer dealers rarely attempt to mislead customers deliberately, but it is not unknown for them to get carried away with their own enthusiasm. Indeed twice within the last few months one of Britain's best known micro manufacturers has been obliged to amend claims in his advertisements. Polygraph in hand, ***JULIAN ALLASON*** *went down to monitor some of the sales spiel.*

SALESMAN: "This Tandy TRS-80 is extremely fast and very powerful"

Translation: This Tandy TRS-80 is fairly slow and not particularly powerful - and neither are its direct competitors. Although its Z-80 CPU runs faster than the 6502 microprocessor at the heart of the Apple, PET and Atari computers, it executes Basic almost as slowly as they do. If you measure power by the ability to address large amounts of onboard memory, then none of the popular 8-bit micros can be said to be particularly powerful. The maximum amount of ROM and RAM that they can address directly does not exceed 64k bytes, equivalent to 65,536 characters. The new generation of 16-bit micros will happily address many times this amount.

"Being solid state, it shouldn't go wrong."

Translation: Being solid state it shouldn't, but it probably will. Problems are less likely to arise if the components are of Japanese origin, Nip chips being up to eight times less likely to fail than the American variety, thanks to better quality control. The most likely source of trouble will be the mechanical parts, such as the disk drive.

"You are protected by a full warranty."

Translation: You are protected by the Sale of Goods Act. Some warranties are so short - Commodore offer a miserable 90 days - that you would do better to rely upon your statutory rights. In any case, your claim is against us as vendors, not the manufacturer. Unfortunately for you we are not one of the dealers who back the systems we sell with our own two-year warranty.

"You can add more memory"

Translation: Sure you can - at a fancy price! This may mean replacing the perfectly good existing RAM chips with the double density variety, which is an expensive way to carry on even assuming that the manufacturer hasn't taken a leaf out of Commodore's book and filled up the memory expansion sockets with solder or drilled holes in the board. He may even insist on doing the upgrade himself as Tandy used to, again at a premium price.

"It runs under the standard CP/M operating sytem so you will have literally thousands of programs to choose from."

Translation: It runs under the CP/M operating system so you will have literally thousands of programs to choose from, most of which were written in the USA and are unsuited to UK business use. Unfortunately there are several different versions of CP/M so there is no guarantee the programs will work perfectly on your machine.

"This business package is written in BASIC so you can easily adapt it to your own requirements."

Translation: You certainly can if you happen to be an experienced programmer with a taste for a challenge and lots of free time. In which case you might just as well write it from scratch.

"Alternatively we could tailor it for you."

Translation: Our software department has nothing special on for the next three months and could use the business. The work shouldn't come to more than five times the cost of the original package.

"The software is well documented and supported."

Translation: The manual should be finished soon. Although we are not familiar with every program we sell, we are confident the authors will answer your letters when they have time.

"This system is tailor-made for your application."

Translation: This is the only system we stock in your price range.

"No previous experience is necessary to operate it."

Translation: Unless you happen to be new to computing...

Dear Diary...

0900 hrs Letter to Distributors enclosing 3 individually typed product description sheets in French, German, Spanish, Greek and Russian.

0930 hrs Technical Specification for new chemical plant typed in. At the same time part of the 200 address mailshot for Spain was printed out.

1200 hrs Employee files for UK, France and Germany re-arranged in departmental and alphabetical order.

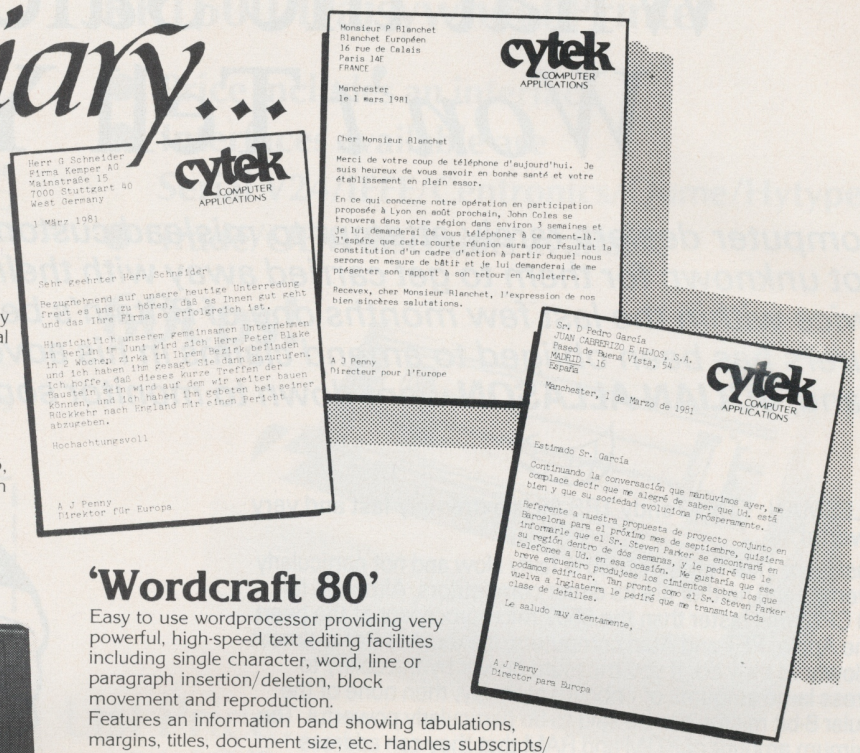
1400 hrs Several letters typed to the new Hamburg office.

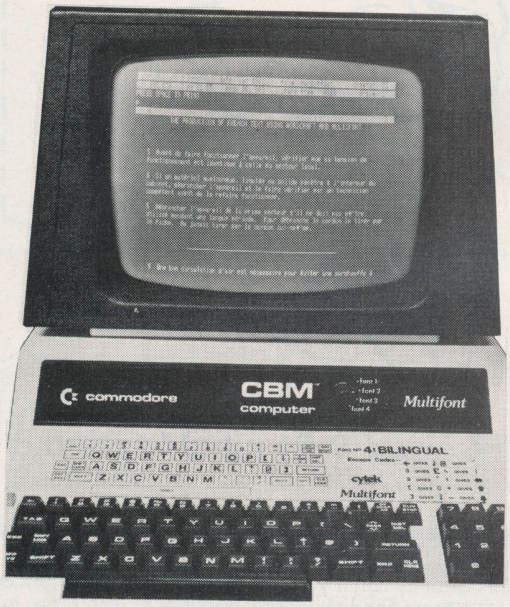
1500 hrs Technical specification amended and six double-spaced copies printed out.

1545 hrs List printed out of all customers aged 25-35, living in Dortmund and Bordeaux who own Model 2310 AZ — batch 25463.

1615 hrs Final technical specification printed out at 15 characters per inch.

1645 hrs 200 envelopes individually addressed to regular customers.





'Wordcraft 80'

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This practical upgrade allows the operator of Wordcraft/Petaid to see the result of different printwheels before printing a document. Up to 4 different fonts are available at any time and it allows you to see on the screen characters such as £ β ∞ ü é © ± and many more.
The standard character sets available are:
Scientific Multifont — for laboratories, schools, universities; **Legal Multifont** — for solicitors, etc.; **Commercial Multifont** — for general office use; **European Multi-lingual** — French, German and Spanish; **Non-European Multi-lingual** — Modern Greek, Russian and Japanese (Katakana). "Specials" can be produced to order.

For further details contact Cytek on 061-872 4682 or selected dealers listed below.

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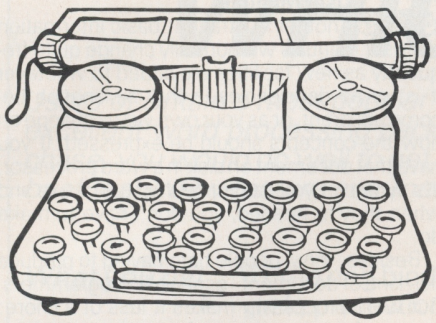


What's Word Processing?

Individual single-page letters might not gain much from word processing. By the time you've loaded the WP program, set up the parameters, made the printer ready and produced the text it would have been quicker to type the thing. But as soon as you require more than one page and/or more than one copy and/or different versions of the same basic text, you can justify the use of a word processor.

by DENNIS JARRETT

IBM and a gent by the name of Ulrich Steinhilper usually get the credit for inventing word processing - or at least thinking of a name for it. Mr S. worked for IBM Germany, selling the early 'memory keyboard' products there in the mid 60s. They were basically no more than automatic typewriters - you typed a letter on to paper but at the same time it was recorded on to magnetic tape so you could play it back. The big plus was the ability to make corrections and alterations before you printed out the final copy: but a second advantage over conventional typing was the capability for doing variable inserts, with one standard letter on the tape and different names, addresses, saluations and other matter added by the typist.

Subsequently IBM junked tape in favour of magnetic cards (around the size of a punched card, for no very good reason, and storing about one letter's worth of text before you had to load a second continuation card). It also added typewriters with an internal memory (more for storing frequently-used words and phrases than for whole documents). IBM then sat back for ten years and let everyone else pick up the idea: word processing is a market that IBM should dominate right now, but it doesn't.

Electronic Office

The Steinhilper contribution was textenverarbeitung, one of those portmanteau words that German does so well. It doesn't really mean very much; but it was a convenient marketing-man's umbrella expression for the broad range of office document production and reproduction activities, rather as the term 'electronic office' is being used in the 1980s.

On the other hand 'word processing' achieved immediate impact in the States as a straight upgrade for typewriting, a situation embodied in the espousal of a vile phrase like 'power typing'. That fitted with the history: between the wars a US company called Shulz which made pianola rolls started supplying automatic typewriters that recorded text (only letters, really) on fanfold punched cards rather like pianola rolls. During the war punched paper tape appeared with the Friden Flexowriter, and a firm called International Business Machines got the lucrative contract to supply similar machines that would allow the US Department of Defense to mass-produce personalised next-of-kin letters.

The typing angle was very strong. And because the economic influence of the States tends to determine what products are offered and how they are used, the typewriter-replacement idea came to dominate WP thinking.

Which is very sad state of affairs, because the real impact of word processing should never be seen simply in terms of automating the existing procedure. It's true the immediate appeal and the immediate cost-justifications may come from doing the same job in the same way - only faster. But that is a very blinkered approach.

So what is WP? We'll stick with word processing, though 'text processing' is probably a more sensible term. It is essentially about getting information from one person to another in the form of documents, where the term 'document' means just about anything that is or could be provided in hard-copy form. In practice there are four key elements to this process, and they summarise what it's all about:

- origination
- amendment and correction
- despatch and delivery
- retention of copies

The other important fact to bear in mind is that word processing always involves software running in a computer. That's obvious on the PET: it's not necessarily so evident with the purpose-built stand-alone single-function WP systems. Being computerised means the chance to define and perform functions automatically and repeatedly: it also means the ability to store information and manipulate it without reference to its final form. Those two attributes set word processing apart from typing.

"Word Processing should never be seen simply in terms of automating the existing procedure."

At the start someone produces a document - it could be a memo or a letter or a novel or a report or an article for PRINTOUT. You get it into the computer (could be via an optical character reader or transmission from another computer, but probably it will involve a keyboard). You subsequently revise it, adding and deleting and correcting mistakes: that may happen more or less immediately, or you might call up a previously-stored document to alter. You might in fact call up several documents and merge them together. Or you might just want to take some parts of them. Either way you will effectively be making a new document, which itself could be stored for later recall.

Automatic Spelling

Some of the alterations you require can be done automatically. This depends on the power of the word processing software. But for instance there's a current fad among WP item designers for automatic spelling checkers - the system has a 'dictionary' of several thousand words, goes through your text for you, and high-lights any word it doesn't recognise. It's either a mistake or a new word to be added to the dictionary. And at the very least you should expect to be able automatically to search through the text for a word or phrase and replace it with another.

And you can replicate some or all of the text for a series of different recipients. Report writers, for instance, could produce a standard text to be sent to a variety of different recipients with cosmetic changes that effectively customise the piece.

Keeping Copies

Eventually you will want to arrange for the despatch of documents, typically by fitting the document into a particular format (various alternative formats - such as memo, letter or invoice - can be predefined quite separate from the text itself) and printing it out. That isn't necessarily your only option for despatch, since you might be able to send a copy of the document on disk rather than on paper for the recipient to load and run on a compatible WP system. Or your reader might just call up the document and study it directly on your screen. Or you might be able to transmit it to the receipient's own screen. Again, this need not happen immediately - you can store all or part of the document until you need to send it.

Because the whole process is computerised it is extremely easy to take copies. In fact WP is based on storing and accessing files, so keeping copies is an inherent feature of word processing. The WP system should be able to help out with the housekeepinng here - automatically adding identifications and dates to stored documents - for instance, and not allowing you to delete or overwrite a file unless you're really sure you want to.

The computer means that word processing is likely to be more than mere automation of typing: the use of the display screen guarantees it.

Doing your document creation and editing on a screen obviously separates you from the procedures and contraints of the typewriter. With cursor controls, complex editing like block moves, 'cut and paste', and search-and-replace are simple: changes and corrections are easy, immediate, and visible: you don't have to commit yourself to the final printed version until you're satisfied. There is less temptation to compromise and leave in ugly phrases or minor errors. You get fewer interruptions than are necessitated by paper handling or Snopaking. The screen-based word processor will copy automatically with line and page ends: so you don't have to worry about overrunning a page limit or a right-hand margin.

In principle, word processors will enable fast typists to go faster, they will greatly improve the productivity of inaccurate typists, and they will enable poor typists to do at least some useful work. And that's a really important point: anyone can perform really quite well on a word processor, because the inherent editing facilities

mean the system is considerably more tolerant of the untrained.

Sure, you have to know the operation of the word processor: and fast keyboarding does help. But because you can alter and amend freely, the significance of the word processor is really that it cuts out the middle operation, the transcription from the originator's thoughts or notes or dictation into typing.

Mathematics

That demands a different way of thinking from typing. So do the kind of functions you might find in a decent WP package - mathematical functions, for instance. These might allow you to insert, delete and move columns within text. Most word processors feature 'decimal tab' which automatically aligns figures around the decimal point (looks a lot neater). Some have VisiCalc-like facilities for doing arithmetic within columns on the screen too.

Well, it's really a computer and not a fast typewriter. That accounts for the remarkable 'information handling' or 'file processing' features in many WP systems: manual and automatic control of information retrieval, creation of specified record formats, multiple selection criteria to pick out the information you want, automatic merging of that with other bits of text. On a small computer like the PET this level of information handling will be done by hooking the word processor into a filing packing like Compsoft's DMS or Bristol Software's OZZ, but the capability is still there.

As an obvious example of how WP can work in practice, it allows a writer like me to think straight on to the keyboard without forcing me to organise too many of my ideas and words beforehand. If I've got it wrong, I can easily switch around or revise the information I've keyed in. I can scan through text quickly to check the flow: as a tool, the word processor ought to make me a better writer.

Not a better typist, mind.

Word processing permits businesses to do things that just weren't possible before - rather like a computer does, really. You can maintain detailed mailing list records, doing sort-and-select runs against a variety of parameters: the result should be a great improvement in your marketing capability in the form of elegant, personalised mailshots. You can considerably improve the format, content, timeliness, accuracy and production time of quotations, statements, and other documents that involve standard phrasing. You can try assembling customer newsletters, trade press articles and internal communications that would formally have been curt and hurried.

User Manuals

Another illustration: basic information like user manuals will normally change quite frequently as new facilities are added to whatever it is, or as deficiencies in the explanation become apparent, or as your own views change on how the concepts should be expressed. If you have that document on disk in a word processor, it's dynamic: you can make the changes as and when they're needed, you don't have to make do.

Besides, most people hate having to produce this kind of document - especially programmers. But word processing makes it less of a chore: you can document the product or the program or whatever in modular fashion - which means as you think of each bit or as you complete a section. Merging the patches of explanation and polishing the result into a real manual isn't so difficult then.

All in all you should end up with better manuals - and while they may actually look better than the mistyped oft-corrected work from the typewriter, the main plus will be the way that the content and the form are more closely matched to the function.

And that's what it's all about.

WP ON THE PET VERSUS 'REAL' WORD PROCESSING

If word processing is just a particular program running on a general-purpose micro or minicomputer, how come there are all those people out there building stand-alone WP-only word processors? How is it they sell so well and make so much money? And how is it that some companies like Wang and IBM and Burroughs actually have separate product lines for word processing and business computing?

There's no shortage of people who will argue that a machine like the PET can't really compete with a 'real' word processor at more than twice the price. Those people typically earn their living by selling the £7,000-plus WP system, but they might have a point.

Hobby Computer

Part of the problem is the question of image and public perception. The WP retailers know that many would-be buyers won't take seriously an all-in computer-cum-word-processor at below £3,500: the 'hobby computer' idea is still very strong. The sheer weight of marketing also mitigates against PET-based WP - the big boys can afford the best PR, the high-cost advertising, the glossy brochures, the expensive business equipment exhibitions. They've got the money for promotion and they have the experience to use it.

After all, there's more to word processing than the WP functions provided. Customer confidence is often a key factor. And not so long ago, the anti-micro people had a point: generally speaking the software packages weren't as good. But in the last couple of years, the performance of the software has improved immeasurably.

Today Wordcraft and Wordpro, (the two leading WP packages for PET) compare well for facilities and functions with anything from the market leaders. They can do most or all of the things that AM Jacquard, Xerox, Philips, AES, CPT, Wang can do. That's no mean achievement. Frankly, the big boys can afford to spend a lot more on ace people to develop the very best facilities for their products. But then there's only a limited number of things you can do with text.

In some ways the makers of WP packages beat their stand-alone competitors on technology, though. The PET word processors can generally operate as quickly, fetching documents from disk and implementing edit commands: that's not at all bad, considering the 'real' word processors will have operating systems optimised for WP. The PET's is intended as general-purpose, with a bias towards the fixed-length records and accumulator-driven operation that characterises data processing - a very different world with very different features from WP.

For the PET programmers to overcome that handicap and still deliver the performance they do deserve a medal or two. But at least there's a common restriction in terms of hardware capability - all the majors implement their word processing on a micro with floppy disks, just as Dataview and Professional Software do for Wordcraft and Wordpro, and that means they are all similarly constrained in the same way on speed and capacity.

Support

Nevertheless there are some important and incontestable ways in which the WP-only word processors are (or should be) better than a PET plus Wordcraft or Wordpro. They derive from the substantial experience and even more substantial budgets that the specialists can call on, and they come under two headings: ergonomics and support.

Ergonomics means matching the person to the machine, and whatever you say about the PET, it doesn't. Well, not particularly well. As an example, look at the keyboard on a typewriter or word processor from IBM or Olivetti: someone has put a lot of expensive effort into deciding where precisely the functions keys should go, how the keytops should be dished, how the keys should slope, how much room should be provided for palm-rests, how the screen should be angled.

Get the idea? All that design and engineering, repeated for every element of the product, is intended to enable you to make most effective use of the thing. Now compare the PET: it's design proclaims loudly that ease of use was not the main consideration. It might have been one of the design criteria, but much more important was the need to build a low-cost desktop computer that could be mass-produced and which was highly maintainable. All laudable goals, to be sure; but someone has to sit at the thing and use it.

The concern with ergonomics applies throughout the design of the system - including the operating procedures (what the user actually has to do, and in what order) and the presentation of material on the screen - what the menus say, what they look like, how much on-screen movement there is to accommodate an edit change, and so on.

Ergonomicists exist, but they are rare and expensive: IBM can afford dozens, Dataview can't. Still, it's an occasionally illusory craft with much diversity of opinion - there's still no agreement for instance about the very best colour for displays (some say yellow on brown is best for ocular perception, others argue that black on white is best for secretarial understanding). And even if there was some agreement, the actual product design will probably exhibit so much compromise between the designers, the budget, and the marketing people that the ergonomics might be submerged beneath the ooze of expediency.

That won't stop the WP vendors paying lip-service to 'human factors engineering' and boasting about it.

Documentation

The support aspect is exemplified by the quality of documentation and training, both expensive extras that are sometimes difficult for the inexperienced supplier to cost accurately. Most sellers of WP software produce the manual they think the buyers ought to have, and then they write the documentation themselves: the bigger WP systems suppliers put time and effort into researching the readers' needs, and then they employ specialist technical authors to implement them.

Again, the big battalions should win, though that doesn't stop them producing some awful manuals. The little leagues are catching up, though their experience tends to benefit buyers of version 4 rather than the hardy pioneers who fought through the thickets of the first stapled-sheet 'manual'.

Ultimately the consideration given to the contrasts between WP-only and WP-as-addition will depend on personal judgements: and the way costs are right now, the PET looks an economical option despite any possible flaws.

In any case things will change: PET word processing will acquire a more professional approach to marketing and support, exemplified by better demonstrations from the dealers and better manuals from the manufacturers. And who knows, maybe Commodore will build a better PET to go with it.

WHICH PACKAGE?

*Users of Britain's most popular microcomputer - the PET - are particularly fortunate in having two really excellent word processing packages available - **Wordpro** and **Wordcraft.** If you are considering a purchase, you would do well to get a demonstration of both. But so that you know what to look for, here is a brief feature-by-feature summary.*

	WORDPRO	***WORDCRAFT***
What you get	Three ring binder containing manual, disk, protection chip, and keyboard overlays.	Four ring binder with manual, loose training cards, disk and "dongle".
Method of protection	ROM chip, plugs into UD11 slot. Fitted by dealer	Dongle - small grey box, plugged into cassette port
Printers handled	Spinwriter, Diablo, Qume, Tec, or CBM/ ASCII	Qume, Diablo, Ricoh, Spinwriter, 3032, 8024, 8026/7 (Commodore's new cheap daisywheel)
Memory capacity	139 lines (by 80 characters). Divided by user into main text and extra text - used for names & addresses or oft-used paragraphs.	11,100 characters including control characters. N.B. the text is free format so the number of lines will vary.
Operating modes	Edit text, Output to Printer, File to or from disk, Erase text or document.	*Command* for all file and print handling. *Type* for creating text, *Control* for special text functions.
On-screen information	Status line showing column and line number of cursor, operating mode and tab stops.	5 status lines with full tab-ruler, cursor position, name and date of document, characters free, etc.
Insertion/ Deletion of text	Using normal INST/DEL key, or in control mode can directly delete word, line or sentence.	Insert or Delete at character or line level only, but with powerful block delete function.
Searching & Changing	Search at both local level (text in memory) or globally (whole file on disk).	Search or Search with Replace - but only on text in memory.
Variable insertions (form letters)	Printing will stop on encountering a 'Break' code allowing insertion to be typed in. Alternatively may be taken automatically from Extra Text.	User creates fill-file of names, addresses, account details, etc. In document, he specifies which fields are to be used, and for which addresses.
Tabulation	Full typewriter-like tabulator with numeric tabstops for aligning columns of figures. N.B. Latest version has arithmetic between fields - VisiCalc style.	Full tabulation, with variable margins, indentation and numeric tabstops all shown on 'Ruler'. Arithmetic only possible by using Petsoft's Wordcraft Link to merge VisiCalc files.
Latest version Price	Wordpro 4 Plus £395 + VAT	Wordcraft 80 F30 £375 + VAT
UK Sales Office	Professional Software Ltd., 153 High Street, Potters Bar, Herts EN6 5BB 0707 - 42184	Dataview Ltd., Portreeves House, East Bay, Colchester, Essex 0206 - 865835

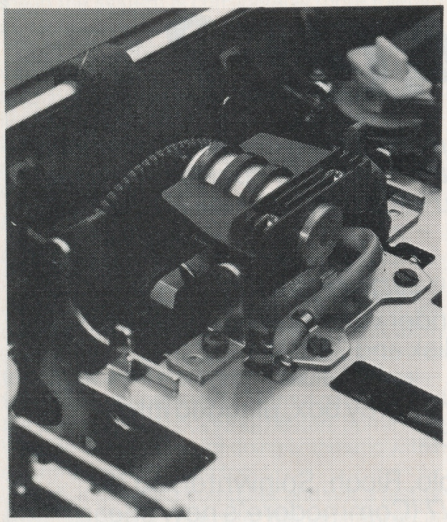
TO SUMMARISE

CBM users are really quite lucky. Both of these packages are sound document-oriented word processors (which means they don't restrict you to playing with one page at a time, as a simpler package might) with the kind of line-end wrap-around you should demand from any WP system these days (in other words, the system automatically handles carriage returns at the end of a line - you don't have to).

WordPro is a good program for programmers, a situation exemplified by its use of terminology from and procedures more analagous to the world of computing rather than the office. The manual also includes a good deal of information on the internals of the package for programmer-users; in particular, you get enough information to link non-*WordPro* files to the system.

The WP facilities are also generally good - notably the linked file-idea and the global commands you can use with them. The 'extra text' memory and the 'disk print' are both potentially useful aids to productivity, enabling you to get more work out of the machine with less effort on your part (can't be bad). Decimal tabs and column arithmetic might also be handy, if you prepare a lot of quotations and invoices, and they work quite simply.

Daisy Wheel Printers. Are they really necessary?



A Daisywheel Mechanism

If you own a microcomputer with disks and a daisywheel printer, you have in hardware terms, the basic building blocks for office automation. Office automation, its proponents will tell you, is a much loftier concept, encompassing the integration of data processing, word processing and telecommunications technologies among other related things such as facsimile transmission and so on. This is all very well for large corporations and multinationals, but the average PET owner is more likely to be a small business proprietor with a limited budget.

This budget may only stretch just far enough for the acquisition of a daisywheel printer, which will in itself cost at least as much again as the computer in the case of Commodore's own low cost daisywheel printer, and may even cost more than double in the case of the higher speed machines from Qume and Diablo, the early trailblazers of daisywheel printer technology.

You may ask why one should invest such large sums of money on a daisywheel printer. Basically, the answer is letter-quality printing. A matrix printer may be perfectly acceptable for invoices, payslips or such documents, but for business letters it is just not on.

This is not to say that matrix printers are not capable of letter quality printing. A basic matrix printer typically forms its characters within a matrix of 7 x 5 dots. A print head containing seven printing needles arranged vertically moves horizontally across the platen, "firing" needles at the ribbon in a sequence to produce the characters.

The spaces between the dots in characters formed within such a matrix are disturbing to the eye, hence the unacceptability of matrix printing for letters and text processing applications. However, if additional dots could be printed on the blank spaces, quality can be improved somewhat as in the case of 'mosaic' printers.

The Sanders Technology printer has refined this technique even further. As a standard matrix printer, it operates at 150 to 200 characters per second (cps). But with the use of up to four passes over the same line, coupled with precision placement of the print head, Sanders Technology has achieved letter quality printing comparable with most daisywheel printers, albeit at a reduced printing speed of 30 to 50 cps.

This means that the user is able to select between letter-quality and high speed printing from one single printer, as well as numerous character sizes and fonts, including foreign scripts such as Arabic, Japanese and so on. However, the price of the Sanders Technology printers is at present bound to be out of the range of the average PET user's pocket, so this example is only used by way of illustration.

If you are fortunate enough to own an IBM golfball typewriter you may be able to connect it to your PET by means of a special black box, the Escon, available in the UK from Data Resources. However, at a price of around £500, plus the golfball typewriter if you do not already own one, you might as well buy Commodore's daisywheel printer, at £950.

For one thing, it is faster, and it is bound to be more reliable in the long run. Furthermore, the maintenance is the responsibility of one vendor, Commodore. So although the golfball mechanism copes with human typing speeds admirably and reliably, it falls down on high speed output from a computer/word processor.

A daisywheel printer is more suited to the job of high speed printing for word processing applications. The golfball mechanism, introduced by IBM in 1961, was a revolutionary concept for its time but IBM has now dropped the technology itself in favour of the daisywheel technology developed by its arch-rival in office systems, Xerox Corporation.

The golfball mechanism dramatically reduced the number of moving parts required in the first electric typewriters. IBM's design featured a horizontally-moving golfball which contained all the characters needed on a typewriter. This meant that the platen could remain stationary while other typewriter manufacturers who stuck to the traditional design had to grapple

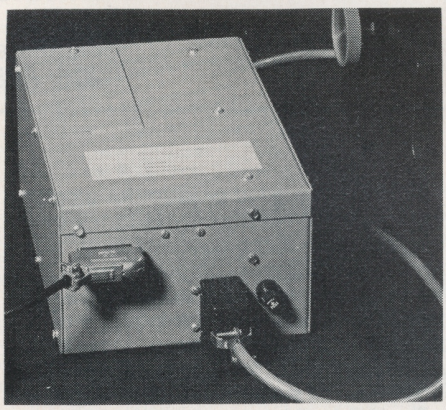
By Boris Sedacca

with carriage return problems, air-cushions to dampen the impact of the returning platen, and so on.

But whereas in addition to the horizontal movement along the platen, the golfball mechanism entails vertical and lateral movements on the axis of the golfball to select the required character, the daisywheel mechanism requires movement along only one axis, reducing its mechanical complexity and logic design. In other words, the golfball is required to move left or right and up or down from its home position whereas the daisywheel moves in one direction only to the required character before returning to its home position.

The golfball also has to move forward to strike the platen. On a daisywheel each 'petal' has a character. Once the required character is in position, a hammer strikes it from the other side against the platen.

If this technology sounds surprisingly simple, it may interest you to know that Diablo, Xerox's office systems subsidiary, borrowed the idea from toy typewriters when it announced the Daisywheel Hytype 1 in 1970. Qume, ITT's subsidiary, followed suit with its own daisywheel printer operating at 55 cps, called the Sprint, and it was only a matter of time before IBM itself would concede to the superiority of the daisywheel mechanism over the golfball when it purchased Qume's printer for its own products, notably the Displaywriter.



The Escon Black Box

One of the great advantages of daisywheel printers is the versatility afforded by the wide variety and interchangeability of typefaces, including European language fonts and special scientific or legal fonts. Here, PET owners have the edge on owners of machines from the conventional word processor manufacturers because with the use of a plug-in device called Multifont, they can actually see on the screen which characters will be printed out by a particular daisywheel, rather than having to type blind.

Manufactured by Cytek, the Multifont device is basically a purpose-designed read-only memory (ROM) module which plugs into one of the integrated circuit sockets on the PET. A template rests just above the keyboard showing which keys correspond to a particular daisywheel's characters.

The only snag is that Multifont is intricately tied in with the Wordcraft word processing software, though Cytek claims to be developing a Wordpro version. If it is any consolation to Wordpro users, their software takes advantage of special features offered by Diablo's daisywheel

Extra-wide printing by Qume

printer and Nippon Electric's (NEC) Spinwriter, such as superscripts and subscripts, and bold face type.

The NEC Spinwriter is also worth a mention because it uses a pseudo-daisywheel mechanism which is reputed to be highly durable and reliable - NEC calls it a 'thimble' print element.

In a future issue *Printout* will investigate the reliability of cut sheet feeding mechanisms. Such mechanisms are important because in the case of repetitive letters, standard computer printout stationery will not do. In a true word processing environment, one does not want to keep feeding the printer with paper. The user should have the facility to put a wadge of letterheads into a feeder in order to leave the printer unattended. Yet there is a weight of evidence that such feeder mechanisms have been unreliable, difficult to adjust and to synchronise with the word processor and have entailed complicated settings which the average user would prefer to avoid. We shall also be giving the results of our in-depth bench tests on the Commodore and other daisywheels.

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PETS & PIECES

by Gavin Sanders

CHIPS WITH EVERYTHING

This month's "Chips With Everything" choice is an absolute lulu. At least it is for me, because I suspect I was badly affected a long time ago by a famous advertisement, headlined "They Laughed When I Sat Down To Play...."

Does anyone remember it? The central character, earlier unable to play a single tuneful note on the piano, had been secretly boning up on a super correspondence course, aimed at making him the main musical attraction at any party. No one knew, of course - they remembered him only as a simple buffoon who couldn't play a thing.

Then comes *the* evening. Replete and ready, he sits down at the piano. Everyone falls about laughing because they've seen him do this before. Then the smiles are wiped smartly from their faces as his fingers caress the keys, and melody fills the room.

Won all sorts of awards, the advertisement did, but I've no idea how good the correspondence course was. I was only a tiny tot when I saw it, leafing through some very old magazines. And *that's* the truth! But a new arrival on the home leisure-cum-entertainment scene brings reality within reach for just about everyone.

Tomorrow's World

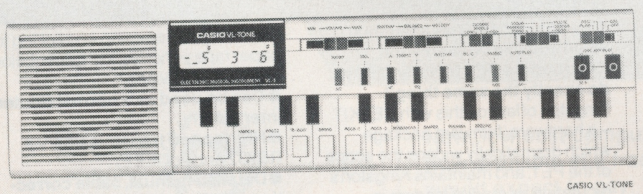
Made by Casio, you may have seen it demonstrated not long ago on "Tomorrow's World". I didn't but a heck of a lot of people seem to, judging from the numbers who keep on saying "Oh my word, you've got one of *those!* Where on earth did you buy it?"

And what is it? It's a very small electronic organ, that's what. How small? About 12 inches by 3 inches. *How* small? Like I say, more or less pocket sized.

So what's so sensational about it, you may well be asking? Small electronic organs aren't new. Rolf Harris has been advertising one on television from time to time for what seems like centuries.

Ah, that's as may be, but take my word for it - there's no comparison. Let's check some of the features off, before we get to the mini-miracle Casio have built in to the thing.

First, this organ has 29 keys and covers about 2½ octaves. The octaves can be shifted up or down by one level, which expands its coverage quite a lot. It has 5 preset voices which you can choose at will - piano, flute, guitar, violin and something called 'fantasy', which is very similar to tibia on great big stand-on-the-floor organs. It also has a 6th voice which you program yourself from - hold tight - around 90,000,000 possible combinations! This last is, in fact, a fully-fledged synthesiser section.



CASIO VL-TONE

Rock to Rhumba

Enough? Well, there's more. The organ also gives you your choice of 10 different rhythm backings, from march through rock to rhumba. It has a volume control, a tempo control and a balance control, the last controlling the relative volumes of the tune and the rhythm backing.

Enough? Sorry. I still haven't got to the big punch-line, but here it comes now: to use this extraordinary device, and dazzle your friends, you *don't* have to have played a note of music before, for you're also given a memory which stores up to 100 notes, and plays them back in any time, tempo and duration you care to choose!

What does this mean? Well, suppose you'd like to play (and be seen and heard playing) some well-known song. You switch the organ to "Record" and at your own speed, key each of the notes in, one after the other, using any sheet music that's handy. It doesn't matter how slowly you go, or even whether you make a mistake, since in the latter event, you have a handy little button marked "delete", which wipes out the last note you entered.

All the keys are marked with letters representing the notes, and also numbers for a special music book which goes with the organ, so even a musical idiot like me can do it.

Nothing on Earth

When all the notes are in, pressing a key marked "auto play" makes the marvellous machine play them back again in *exactly* the hesitant timing you used when you entered them. Which means, of course, they sound like nothing on earth, let alone the tune they're supposed to be. No matter though, for now comes the miracle.

Leaving the organ in "record", you start an appropriate rhythm going. Then, using another key marked "one finger play", you tap out the notes one by one in time with the rhythm.

And the built-in memory remembers the new timing you're now producing. This means that when you've gone through the tune again in time with the rhythm, you now have locked up in the memory a perfect rendition of your tune, beautifully executed and completely in time with the backing.

And you can produce this to order from that point on, to the astonishment of your family. Better, when you play it out, you can switch the instrument voices half way through, or change the rhythm, or shift the melody up or down an octave, all by judiciously manipulating the little switches that do these things.

Everything that's happeneing is shown on a liquid crystal display, which makes life easier, and as the cherry on top, the whole thing is also a four-function calculator too!

Oh yes, and the single VLSI (it stands for Very Large Scale Integration, which is no surprise at all), also has programmed permanently into it a dazzling demonstration piece - it's a German folk song, they say - which shows every function off. You get this to play by pressing a key marked "music".

And how much will this astonishing device set you back? Round about £37 is the unbelievable answer.

I only have to warn you about one thing. If you buy one, be prepared to guard it with your life. Since I got mine a week or two back, I've been elbowed out of the way by my nearest and dearest more ruthlessly and more often than I can remember for anything else I've had.

SUPERSOFT STRIKES AGAIN!

The last few weeks have seen a stream of new goodies landing on my front-door mat from the fecund Peter Calver of Supersoft in Pinner, Middlesex. I dunno how he keeps it up, but he's getting to the stage of being the best software supplier around for PET, that's for sure.

Firmware too, come to think of it, for the first arrival was something called ROM-X, a chip which *doesn't* use up one of those increasingly precious spare sockets in your PET. Instead, it replaces an existing PET chip (UD8, if you'd like to know where in advance), and then produces a number of rather impressive advantages.

The best is probably negative - you don't have to activate anything with a SYS call. ROM-X is operative every time you switch PET on.

From that time, you have a permanent repeat key function; an incredible speed-up of the rate information is written on PET's screen (it's almost quick enough to be called instantaneous); a much increased accuracy for PET's internal clock; the ability to 'user-define' the Run/Stop key; a luke-warm start (as opposed to a cold start, which means turning PET off and on again, and a warm start, which means typing a SYS to reset everything) - the advantage here is the much reduced likelihood of losing programs by accident; and some other good things too.

All in all, it's a clever little chip, and it'll set you back £29 plus VAT which doesn't seem a great deal for the good things it gives.

Messy-minded disk-users

Supersoft also sent me a copy of their Master Directory program, meant to organise messy-minded disk-users, like me for instance. If you don't use disks, it's not for you, nor is it really likely to earn its keep unless you've gone above the dozen or so disk level. After that, however, it gets more and more valuable.

It stores the directory of every disk you have, and tells you a great deal about all of them, in the proverbial twinkling of the eye. Things like which disk a particular program is living on; or how much space is left on any or all of your disks (how often have you tried to save one last program, only to find there wasn't room?); or providing you with a complete list, in alphabetical order, of all the programs on any given disk, and printing it too if required.

All good stuff, and my disk housekeepiing has noticeably improved since Master Directory's been around. The major advantage for me is undoubtedly the ability to locate, in only a second or two, the one program I want from among what's now many hundreds, together with the disk it's on.

At £22 plus VAT, Master Directory is pretty good value as a utility, and also that rare commodity, a disk-based program whose value increases with time and the number of (in Master Directory's case) other disks of which it's keeping track.

The third item to arrive from Supersoft has, however, very nearly turned me off them for ever. Accompanied as it was by a laconic note from Peter Calver, saying merely "Have fun and no cheating!", I've found it infuriating.

Adventure Game

It's called "A Hitch-Hikers Guide To The Galaxy" and - at long last - it's a highly efficient *tape-based* Adventure game. I'm sure that there are a lot of non-disk users out there who've been steadily getting more and more frustrated by their inability to join the growing band of Adventure-players, simply because most Adventure-type games for PET have been disk-based.

No longer. Here's a good one, totally resident on cassette, and costing only £17 plus VAT. I've found it annoying, irritating, frustrating and infuriating, but lest you think that's a condemnation, let me quickly say those are the words most Adventure players use as high praise for games of the genre.

It's also well-written and, so far as I can see at the length I've reached so far, bug-free. I haven't got far, mind you. I keep getting lost in the Disorientation Vortex Maze, which is just inside the spaceship, slightly behind the silver lever marked "Do Not Pull".

Calver, wipe that smile off your face or I won't let you play with my Casio electronic organ!

AND FINALLY.....

Since I mentioned the present for a man who has everything else - remember? it was a binary clock? - it was only a question of time until someone said "I can program that". And first past the post was my old friend and correspondent from County Clare in Ireland, Jeff Brown.

He's sent me a program listing for a binary clock, to be displayed on PET's screen, and very good it is too. Space prevents me including the listing here this month, but I probably will pretty soon.

Certainly leaving the display up and running has great show-off advantages. It gives one such a super feeling of simple *superiority* when people ask "What on earth's that?", and you airily reply "Oh, it's a clock. Why, my goodness, just look - it's 16 minutes past 4 already."

It certainly shut my aunt up the other evening (that's the one I've mentioned before, who keeps on asking of PET "yes, but what *good* is it?")!

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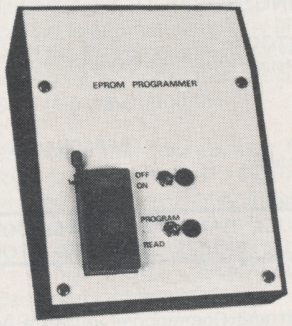

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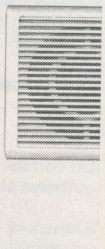

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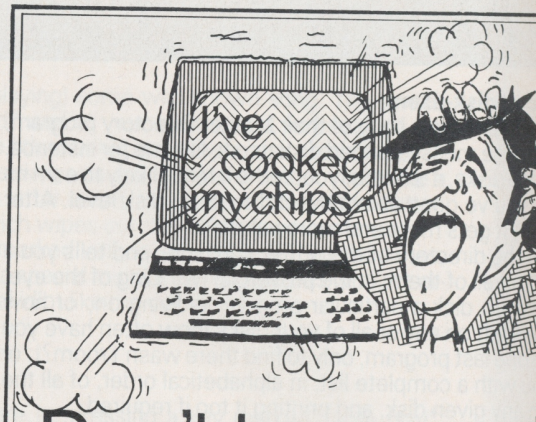

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TOMMY'S TIPS

Special ROM - 007

My thanks to Peter Derriman of Cape Town, South Africa for the following letter. The problem however, is that the #7 ROM seems to be rather elusive. Still, if you can get one, it looks rather better than past efforts.

"Concerning Lindsay Doyle's PRINTOUT Wordprocessor - a recent issue of *CURSOR* mentioned that with the new ROM 3022 printers it is possible to put the printer into a mode whereby the printer displays exactly what would be shown on the screen - with regard to upper/lower case.

There is a new secondary address in the version 4 printer ROM - #7.

OPEN 7,4,7 : PRINT#7

and if you have used upper and lower case in a program, a listing on the printer in the normal way will produce upper and lower case. Unfortunately there is no known way of putting the printer back to its normal mode, without powering off.

Note that if you do want to use upper and lower case you would have to use a " at the beginning of every line just as mentioned for graphics.

A slightly more elegant way to get blank lines is:

line number, shifted blank, blank, shifted blank

It works although I don't know why."

BASIC Upgrade

My PET is model 3032 with BASIC 3.0. Is it worth upgrading to BASIC 4.0?

William Murphy

Depends how rich you are feeling, Bill. Certainly it would be worth doing if you plan to buy one of the new disk drives with DOS 2.0 installed - that is to say the 340K model 4040 or the one megabyte 8050 - although not essential. BASIC 4.0 has lots of disk handling commands that replace some of the syntactical monsters that the earlier versions called for. That apart, the only reason for changing would be if you go in for extensive string handling, in which case you have my sincere sympathy. Garbage collection is greatly speeded up on BASIC 4; however. And of course you would be compatible with the latest business software, virtually all of which is written for BASIC 4.

Running without effort

If a Clear Screen, Cursor Home, etc. instruction is included in the title when SAVEing, the instructions are obeyed on a subsequent LOAD. Is it possible to include a RUN command, so that even with LOAD instead of SHIFT/RUN-STOP, the program runs immediately on loading?

Wilfred Higginson

Full marks for an interesting idea, Wilfred. Including the Clear Home character in the SAVE name certainly makes for a nice effect on loading. Unfortunately the RUN idea just doesn't work - even if you use the token for RUN, in the string.

There are some programs which will automatically Load and then Run. Wordcraft is one of them. However, you need to be pretty adept at Machine Code to do it. If you are interested, the procedure is as follows:

The program starts way, way down in the memory map; down in the stack as a matter of fact - and believe me, mucking around in that neck of the woods is one of the easiest ways to crash unless you really know what you're doing.

You see, when BASIC does a Load it jumps to a special subroutine and leaves the return address on the stack. If your program can overwrite this address, then instead of returning to the "holding loop" to wait for a command, it jumps to a Machine Code routine in your code. This then initialises various pointers and jumps back to the BASIC operating system.

Mike Todd's excellent series, ***How Basic Works*** *(see page 58) will help clarify this. But to design an Auto-Run you will need a lot of luck, source listings, or money (with which to bribe Wordcraft author Pete Dowson into divulging his secrets!)*

Pulling the chain

I understand that it is possible to chain the operation of one program to another, simply by placing a LOAD statement at the end of the first program. However, it seems that unless the second one is shorter than the first, the system will always crash - is there a way round this?

Michael Sharpe

Yes - with a little hokey-pokey! You'll have to fool the first program into believing it's bigger than it is immediately before the Load command. For example, to call a 16K program from one that is less than that you need:

```
100  POKE 42,0:POKE43,65
110  LOAD"  EXAMPLE"
```

These two locations determine the pointer to the top of the BASIC program. These will be reset to the correct length of the new program immediately after the LOAD.

The case of the missing socket

I hear constant reference made to the fact that there are 3 spare ROM sockets available to the user. My 3032 only has 2! The third 'spare' socket (UD3) already contains a chip, marked 901447-25. However, when I address location 9000-9FFF via the monitor, all I get is emptiness, as if nothing is there. Removing this chip renders the computer inoperative.

Why is this chip there? Can I get rid of it, and how can I gain access to 9000-9FFF when there's no socket for it?

D.J. Morgan

Very puzzling this one - and a bit suspicious too. I suspect that one of the normal ROM sockets was duff and the supplier has reconfigured the UD9 socket to accept that ROM instead. Even though your machine is out of warranty, you should definitely take the matter up with whoever sold it to you.

Next Please

On using the index in a FOR-NEXT loop as a counter, I find that it is increased by one on leaving the loop, i.e. in the case of **FOR I =1 TO 5: NEXT: PRINT I.** I is printed as 6. I have overcome this problem by decreasing I after the next statement. Is this anomaly usual?

H. Mitchell

Aha, yes, one of my favourites this one. The answer lies in how BASIC operates FOR-NEXT. On encountering NEXT, it jumps back to the associated FOR (the location of which it has saved on the stack). The index is incremented and tested to see if it is ***greater*** *than the upper limit, in which case control is passed to the statement after NEXT. This is necessary as the STEP increment is not always integer. Thus*

```
FOR I = 1 TO 2 STEP 0.4:NEXT I : PRINT I
```

will give 2.2. Clear?

BASIC and Machine Code

Can anyone suggest a method (if there is one) of loading a mixed BASIC and machine code program merely by typing 'LOAD' - other than using DATA statements which take time to read and waste memory?

H. N. Walters

Load the machine code into the PET and then the BASIC program. Then use locations 42 and 43 decimal to find where

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TOMMY'S TIPS

*your program ends, i.e. ?PEEK(43)*256+PEEK(42)+1. Change this to HEX and use this as the end address of your basic program. In my example the result was $194A. Then if the machine code is in the second cassette buffer (826 dec) use 033A(hex) as your start address. Then using the monitor type:-*

S"program",01,033A,194A

If the Machine Code is above the BASIC program use the end address +1 of the Machine Code, e.g. 250B, and use 0400 as the start address and save as:-

S"program",01,0400,250B

This is for cassette #1; for disk the format is a little different. The 01 should be 08 and the program name must start with the drive number 0 or 1.

For old ROM PET owners who wish to save BASIC and Machine Code the method is a little harder, and what appears below is for cassette #1 only.

First type SAVE; press return then the RUN/STOP key. This will set up the old ROM PET tape buffers. PEEK locations 124 and 125 and write them down for reference, and work out how many letters your program name will have; for example "program" has seven letters if you spell it Statesidewise. In this case location 125 has a 31 and location 124 has 25 in it.

We then do the following:

POKE249,0:POKE250,128:POKE229,25:POKE230,31: POKE247,58:POKE248,3:POKE238,7

The numbers 25, 31 and 7 all come from the text mentioned above. Now press the shift CLR button and type the name of your program in shifted graphics or lower case in the top left hand corner of the screen, remembering that in this case the number or letters in the name is seven.

Now press the cursor home key and a few cursor downs, insert a blank cassette and type SYS63153. The message PRESS PLAY & RECORD ON TAPE ONE will appear. After it is saved you can load it back into the PET as a BASIC program. The BASIC program will now have the second cassette buffer contents appended to it.

To save Machine Code ***above*** *a basic program, a few slight changes are needed.*

POKE 229 and 230 with the end address of your program (low/high) and POKE247,0:POKE248,4:

Then use the same SYS address for the save to tape #1.

I said it was simple ....

Time to wake up

I have written a short program to turn my PET into an alarm clock to remind me of my business appointments. Trouble is - I would like to use my PET for other applications at the same time. How can I do this?

Barney Wallis

Such a good idea, I was tempted to write the program for you - but that wouldn't be cricket, would it? Here's some tips:

1. Write your routine in Machine Code and stick it at the top of memory. Use the USR function to communicate the various alarm times to it, and get it to read the Prompt messages from BASIC strings.

2. Wedge the routine into the interrupt vector which you will find in locations 144 and 145. This means that your routine will be inspected every 1/60th of a second and it can compare the current time with alarm times.

3. If you have an 8032 PET then the bell may be sounded from Machine Code by a JSR $E02A.

4. Using this method, any BASIC program can be run concurrently - your alarm program being, as it were, transparent.

If you aren't very confident on some of these techniques, Barney, I reluctantly recommend you get "A Hitch-Hiker's Guide to the PET" by Chris Preston - a rival of mine!

I should think that a program guaranteeing to wake managers up for their appointments would be quite a moneyspinner!

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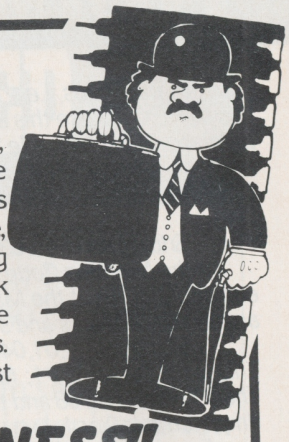

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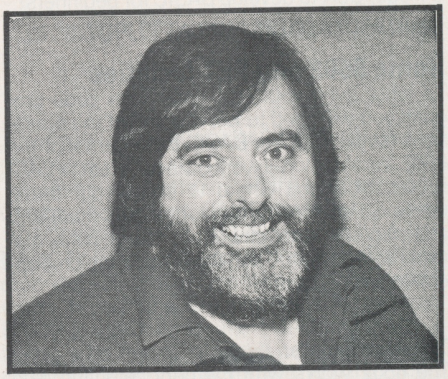
LEARNING ASSEMBLY LANGUAGE



Almost one in every two letters received here at *Printout's* editorial office asks about learning Assembly Language or Machine Code. Some are from users who want to speed up their programs but don't know where to start; others from programmers who've bought a book on Machine Code only to find it incomprehensible. What follows is the first in a series of articles that will teach Assembler *from scratch,* specially prepared for us by Mike Gross-Niklaus, an experienced training manager.

This series of articles is aimed at those of you who know BASIC (and PET), and who need Assembly language either because the BASIC programs you use in your work are too slow, or just because you want to advance your knowledge of programming.

The chances are that you will have written quite a few BASIC, or possibly PASCAL , programs and that you understand how to load and save programs on disk. I am assuming you know how to use the keyboard to edit your programs. If you have played about PEEKing and POKEing various locations, making the operating system and BASIC interpreter do weird and wonderful things, then that is all to the good.

You will need access to a CBM disk system, which can be either 3000, 4000 or 8000 with a minimum of 16K storage. You will also want an Assembler package, of which there are now quite a few suppliers. I will illustrate the articles with examples using the Commodore Assembler on a 32K 3000 system.

The series takes you from scratch to a point where you can use an Assembler package to create your own machine code subroutines and programs. These programs may manipulate information held in memory, or interact with the keyboard, or with the User Port. The articles do not cover floating point arithmetic or IEEE 488 bus operations, which may be covered in a later series.

I have found in teaching Assembler Code programming, that many students have already tried to teach themselves, but that the mass of preliminary information you are expected to absorb before you get anywhere is so enormous as to discourage you. A working knowledge of Binary, Hexadecimal, Binary arithmetic, 6502 processor architecture and functioning, relative addressing and so on are all necessary before you can become competent Assembler code programmers, but as part of the learning process we can write satisfying programs with far less knowledge.

So in these articles I take a pretty simplistic view, avoiding the difficult bits and giving you just sufficient information to enable you to prepare and run Assembler code programs as soon as possible. As an introduction I believe this approach works. My students, who write their first Assembler code program within an hour of the start of the course, will bear me out. Having read these articles, or in parallel with them, I strongly advise you to study 6502 machine code programming in detail. Later I will mention one or two tutorial books which provide excellent study courses.

As the articles progress, you will build up a repetoire of techniques which will allow you to do magic with the screen and keyboard, manipulate strings and arrays in BASIC, add extra commands to BASIC and use the in-built ROM routines, but the main aim of this article is to get you used to the Assembly process. We'll look at the following aspects:-

1. Why we need Assemblers.
2. What the Assembly process is.
3. Sufficient 6502 facilities for you to write your first Assembler code program.
4. Coding a simple Assembler program.
5. Assembling the program.
6. An exercise for you to try.

Why bother with Assemblers.

The 6502 processor at the heart of the PET and other microcomputer does it's stuff using pulses of electricity. These pulses operate electronic 'gates' placed on the various electrical paths inside the processor, causing the output of other pulses which constitute the result of the process.

It's fairly easy to translate holes in cards, for example, into electrical pulses. And that is the way early computer programs were written. I can well remember the program cards we used for LEO I, the world's first commercial data processing computer, (which occupied a 40 by 40 foot room and had the power of one of today's programmable calculators!). Such a program card is illustrated in diagram 1. We used to hold competitions to see who could get the most interesting program into the 24 machine code instructions which each card could hold.

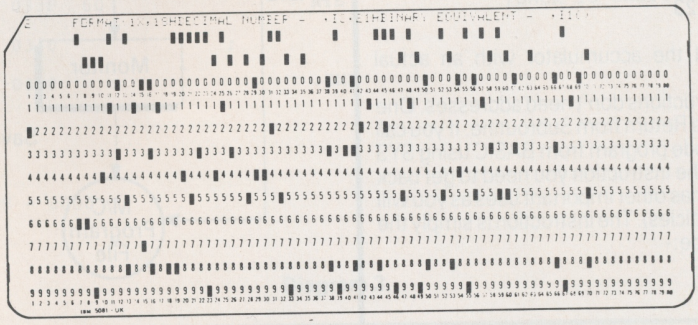


Diagram 1: Early Computer Program Card

But when it came to writing these programs down on paper, and trying to read them back say six months later, in order to change some aspect of it, well the task was nearly impossible. And if it was someone else's program, then it was usually quicker to re-program the thing from scratch! Even when we did find the bit that needed amending, it was usually necessary to insert some extra code, moving all the rest along in the memory, and having to alter all the memory references to suit. Most of our time was spent correcting errors arising out of the difficulty of editing our programs.

What an Assembler does is give you the chance to write and edit your machine code programs in a quite readable text, with as much annotation and as many 'variable' names (called Symbols, hence 'Symbolic Assembler'), as you need. This text can be saved away, pulled back, changed and edited in any way you like, before being converted into a machine code program.

The Assembly Process

The process is illustrated in diagram 2.

First using the Editor, you create the text of your program. This text is called the Source code, and is saved onto disk as a sequential file.

Next you load the Assembler program, and tell it the name of the source code file on which it is to operate. The Assembler reads the source code twice. The first time it collects all the symbolic names into a table. The second time it translates all the operations and names into the ones and zeros with which the 6502 works. The Assembler saves this translated code, called the Object program, onto disk, again as a sequential file.

Next you load the Loader program. This reads the Object code file into memory as a machine code program. You can then call this machine code program using the BASIC SYS statement for example.

Finally, if the program is working properly, you can save this memory version using the facilities available in the PET built in Monitor. From then on, you can load this machine code version without going through the Assembly process.

Usually, there will be errors, so you will have to reload the editor, get back your Source file, re-edit it and go through the Assembly, Loader and Save process again.

Newcomers to Assembler code, particularly those of you used to BASIC alone, will on many occasions, complain bitterly about this long-

winded process. All I can say is: "You can't imagine the frustrations we had before Assembler came along", and "Wasn't it nice of Dartmouth College, USA to develop BASIC for beginners!"

Some 6502 and PET facilities

To write even your first Assembler code program you will need to know some of the operations (somewhat like BASIC statements) of the 6502, what they will work on (equivalent to BASIC variables) and where to find or put these items. So let's take a first look inside the 6502, and also see whereabouts in the PET the machine code program and the Data on which it operates can be stored.

The Accumulator

The 6502 works with memory cells and data paths which are eight bits wide. That is to say in a cell or on a data path can be a pattern of eight ones and zeros. The 6502 processes the information in 8 bit registers, which are specialised memory cells if you like, actually on board the microprocessor chip itself.

The main register is called the Accumulator. It is used to do arithmetic, and many other operations on data. You can copy the pattern in a memory cell to the accumulator, (called Loading the Accumulator) or copy the pattern in the accumulator to a memory cell (called Storing the Accumulator).

Most Assembler code instructions are made up of two parts, the operation and the address. For example:-

```
LDA 32768
```

means Load the accumulator with the pattern held in memory cell 32768.

And

```
STA 32769
```

means Store the pattern in the accumulator into memory cell 32769.

You can also load the accumulator with the actual value of the address portion of the instruction, (called Load Immediate). The Assembler code requires a hash sign before the address if you want to do this. The maximum value is 255. For example:-

```
LDA #123
```

means Load the accumulator with an actual value : 123.

Some instructions don't need addresses. One of them is the Return from Subroutine. If you call a machine code program from BASIC using SYS them this is the instruction you need to get back to BASIC. (It has other important uses as you will see in later articles). The instruction is simply the operation code:-

```
RTS
```

If you are using machine code programs as subroutines to your BASIC programs, you want to be sure that BASIC doesn't trample all over the memory cells where the machine code program or it's data are stored. One good way, which we will use later, is to kid BASIC it has less store than it thinks by POKEing the 'Top of Memory' pointer to a lower value. But the cassette buffers are left alone by BASIC unless you are using a cassette deck, and are quite big enough for small programs. We will store our first programs in the second cassette buffer.

One problem with machine code programs is that to get a tangible result requires routines which use facilities with which the beginner is not yet familiar. Luckily with the PET we have Screen-mapped memory. Many of you will have POKEd information onto the screen. Provided you write exercise programs which deposit their results into screen memory then you will be able to check instantly on the success or otherwise of your programs.

Screen Memory - starts at memory cell 32768
Cassette Buffer 2 - starts at memory cell 826

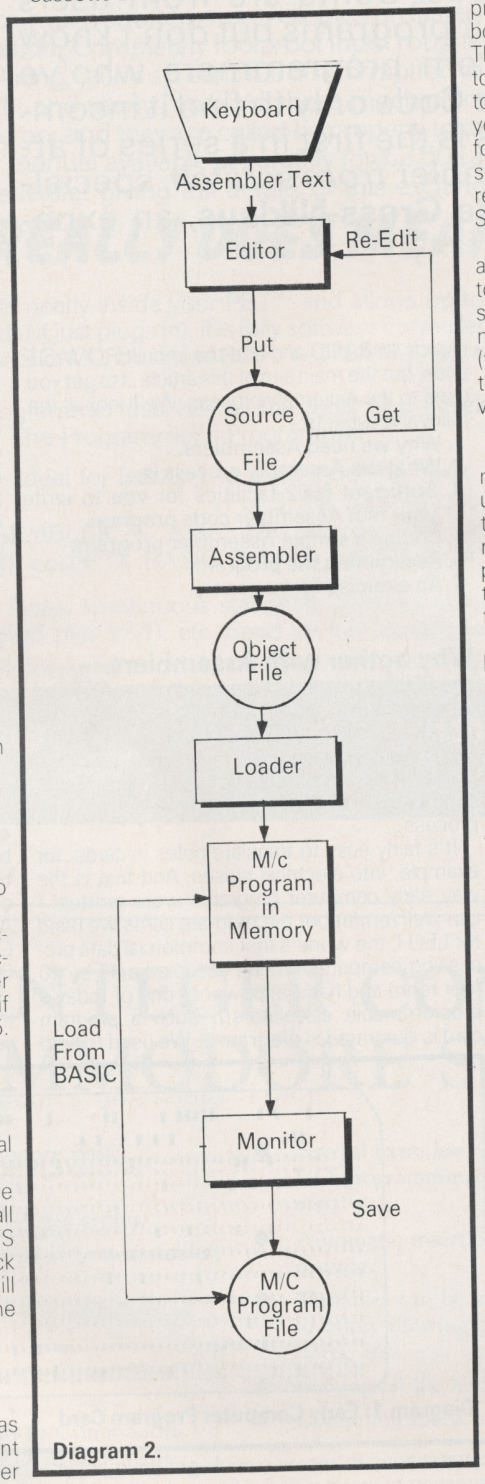


Diagram 2.

Coding and Assembling a simple program

In fact the program is so simple you may laugh. It puts an 'A' in the top left-hand corner of the screen! The BASIC equivalent is POKE 32768, 1. But although this may seem trivial, it demonstrates many of the essential points about coding in Assembler. Let's look at the Assembler code, then how to create the Source, Object and Machine code versions.

We have to put a value of one into memory location 32768.

As a first stab, using the instructions described above, you might write:-

```
LDA    #1
STA    32768
RTS
```

This is valid Assembler code, but to make the program more readable, it's better to use symbolic names instead of actual memory locations. The Commodore Assembler allows names of up to 6 characters. While you are learning it is better to stick to alphabetic characters. For example, you could replace 32768 by SCRTOP (standing for Screen Top). You will need to tell the Assembler once what memory location SCRTOP refers to. This is normally done at the start of the Source text. For example SCRTOP=32768.

Remember that the Source code is processed and the symbols and operation codes changed to patterns of ones and zeros. You can make the source text as verbose as you like using Comments, which are preceded by a semi-colon, (the equivalent of BASIC REM). Unlike BASIC, these annotations will not take up space in the working program.

You need to tell the Assembler where the final machine code program is to go. The Assembler uses a special symbol, an asterisk, to indicate the point in memory it is dealing with at the moment. You can set the value of this symbol at any point in your Source text. We want the program to be in the second cassette buffer, so before the first operation code, you should type *=826.

In order to allow the editor to insert and delete lines of source text, each line is numbered, in much the same way as BASIC.

Finally, the Assembler needs to know at what point to stop the assembly process, so the last line in the source code is an end signal. The Assembler recognises and acts on several such signals, which affect its operation in some way. All commence with a full stop, followed by the appropriate code, in this case .END .

Now let's have a second stab at the Source text:-

```
1000 ;TOP LEFT A
1010 ;MIKE GROSS NIKLAUS
1020 ;20.5.81
1030 ;FOR PRINTOUT
1040 ;
1050 SCRTOP = 32768
1060 ;
1070 * = 826
1080 ;
1090 LDA #1        ;PET SCREEN CODE
                    FOR 'A'
1100 STA SCRTOP    ;TOP LEFT OF
                    SCREEN
1110 RTS           ;BACK TO BASIC
1120 ;
1130 .END
```

Assembling the program

Assuming that you've written your program down on paper, the next step is to process it to the point that you have a working machine code version in memory. Have another look at Diagram 2 to remind yourself of the process involved. I will illustrate it using the latest version of the Commodore Assembler package on a 3032 PET.

First Load and Run 'Universal Wedge', which puts all the DOS support commands at your disposal. Since it is the first program on the diskette, you could load from 'cold' using LOAD"*",8.

Next load, but don't run, the version of Editor appropriate to your machine. A look at the directory will show you which you need. For the 3032 you would type /EDITOR32K*. The reason you

should not try to RUN the editor is that it's a machine code program placed at the top of store, so can't be preceded by a little BASIC SYS program. You must enter the Editor using a direct command, SYS 28672 for the 3032.

Now you can enter your Source code text. Don't forget the line numbers. The editor has many facilities similar to those of the PET Programmer's Toolkit so if you want Auto line numbering, typing 'AUTO 10' will give you line numbers spaced 10 apart. The REPEAT key facility is automatically installed the moment you press the RETURN key for the first time. Don't forget the .END as your last line, otherwise you will have problems with the assembly.

The editor has a special command for creating sequential files for Source text called PUT. It strips off the line numbers and assumes you want to put the file on disk. You must give your Source file a name. A good idea is to use the last few letters to indicate what type of file it is and distinguish between BASIC and Machine Code, Source and Object. A common convention uses 4 characters including a full stop.

File name	.SRC Source
(is)	.OBJ Object
(same)	.BIN Binary (Machine Code)
(throughout)	.BAS Basic

So to save your TOPLEFTA program you might type:-

```
PUT "@0:TOPLEFTA.SRC"
```

Notice that you need the drive number (0: in this case) and can use Save with Replace (@).

If you want to recover your source file, to edit errors for example, the editor provides the command GET. This is not the GET from BASIC. It assumes disk drive and sequential file, loads the source file and re-allocates line numbers starting at 1000, 10 apart.

```
GET "0:TOPLEFTA.SRC"
```

From here on the process gets rather boring as there is little for you to do.

Load the Assembler, ↑ASSEMBLER* in the case of the 3032. The Assembler is a Machine Code program, but is preceded by a small BASIC program containing a SYS call, so can be RUN. You will be asked for a name for your Object code program. For this example you might type:-

```
0:TOPLEFTA.OBJ
```

You will next be asked if you want a hard copy output. Have one if you want, but this program is so small that the total Assembly output will go on the screen. **Diagram 3** shows what you should see.

Some of the output may appear mysterious, consisting as it does of Hexadecimal values. The most important thing for you to look for is the ERRORS message near the end. Hopefully if you (and *Printout* magazine) have typed the example text exactly, there will be no errors. For the time being let's assume just that, and deal with Assembler errors at a later date. You should recognise your Source text on the right side of the listing. The stuff on the left is a short-hand way of depicting the ones and zeros of the Machine Code version, called Hexadecimal. Forget most of it for the time being. The second column shows the memory cell into which the Assembler is assembling at that point. We asked for the program to start at 826 for which the hexadecimal equivalent is $033A. If the value in column 2 opposite the LDA #1 is not $033A then you probably forgot to include the *=826 line.

Now load the Loader program. You have a choice of three, which locate into low, mid and high memory. That's to allow you to choose one which doesn't get trampled on by the program you are loading. Since you are using cassette buffer 2 for the assembled program, it doesn't matter which one you use, so pick the Low loader version, which allows you to RUN, '↑LOADER*'. Ignore the "Offset?" question by pressing the return key. You are asked for the Object code file. For the example the reply would be "0:TOPLEFTA.OBJ". As the hex values of the Object file are loaded into memory, they are printed on the screen.

Now you are at the point where you can run your program, using the SYS 826. Hopefully an 'A' will appear at the top left of the screen, and the READY message wherever you last left the cursor. If it doesn't then there is an error somewhere, and you will have to get back into editor with SYS 28672 (yes, it's still up there!), GET back your source text, edit it and go through the Assembly process again. If the code you did assemble hangs up the machine, you will have to switch off and start up again. Assembly programmers learn to move more slowly and check more thoroughly than their BASIC colleagues!

Let's SAVE the Machine Code program, not because it's a masterpiece but just to see how the process is completed. You will need to use the Machine Code Monitor which is built into the ROM chips of the PET. SYS 1024 will get you into Monitor. More Hex values appear on the screen, and because the Monitor only understands Hex addresses, you will have to tell it what portion of memory to save using hex addresses. No big problem, because you already know that your program started at 826, Hex $033A, and for small programs in cassette buffer 2, an end address of $03FF will suffice. The Monitor command for save is '.S', and you need to specify device 8, in Hex that's 08, as well as the normal business of drive number within the file name string. So you might type:-

```
.S "0:TOPLEFTA.BIN",08,033A,03FF (Ret)
```

You can regain normal BASIC mode by typing .X (Return).

From now on you can load the Machine Code version directly from BASIC mode, e.g. 'LOAD "0:TOPLEFT.BIN",8'. If you want to type in a BASIC Program after you've loaded the Buffer 2 program, you should type NEW first. This won't touch the buffer 2 program but will reset the BASIC pointers which the LOAD into buffer 2 leaves a bit messy. You can call your machine code routine as often as you like from the BASIC program by including SYS 826 as a statement at the appropriate point.

```
LINE  LOC   CODE        LINE

0001  0000              ;TOP LEFT A
0002  0000              ;MIKE GROSS NIKLAUS
0003  0000              ;20.5.81
0004  0000              ;FOR PRINTOUT
0005  0000              ;
0006  0000              SCRTOP = 32768
0007  0000              ;
0008  0000                      * = 826
0009  033A              ;
0010  033A  A9 01               LDA #1          ;PET SCREEN CODE FOR 'A'
0011  033C  8D 00 80           STA SCRTOP      ;TOP LEFT OF SCREEN
0012  033F  60               RTS             ;BACK TO BASIC
0013  0340              ;
0014  0340                      .END


ERRORS = 0000
```

Diagram 3.

An exercise for you to try.

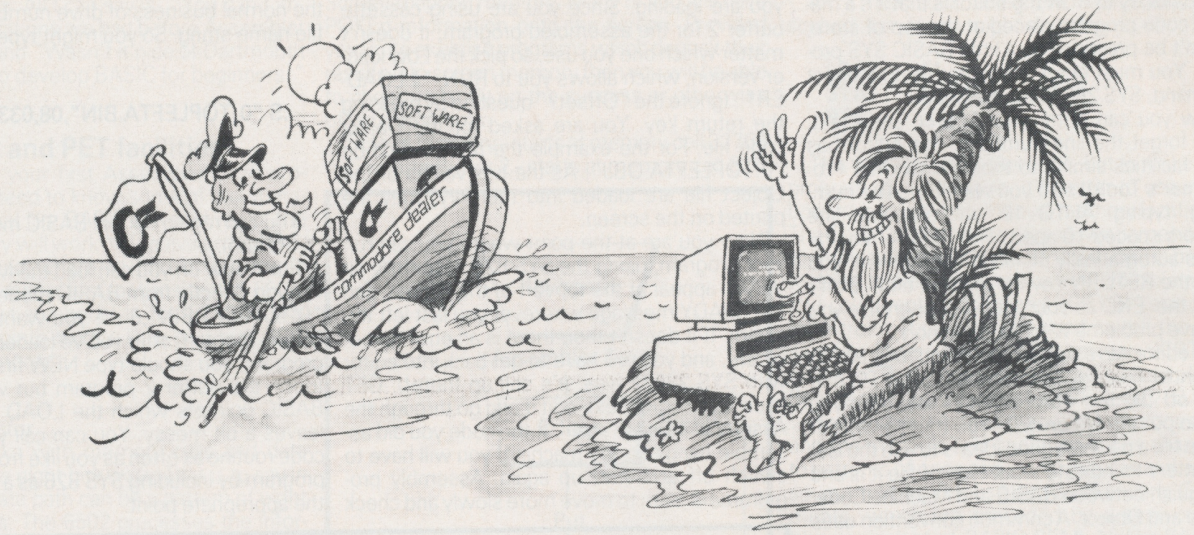
Use the points made in this article to try an exercise for yourself. Even if you don't yet have an assembler package, you can write the Source code and perhaps even hand-assemble it.

Use LDA # and STA to write your first name at the top of the screen.

Note: PET screen codes for A-Z are 1 to 26 respectively.

Next time

In the next article, you'll see how to create program loops, count and process a series of continuous memory cells. You'll use these facilities to make the screen flash and do other magic things.



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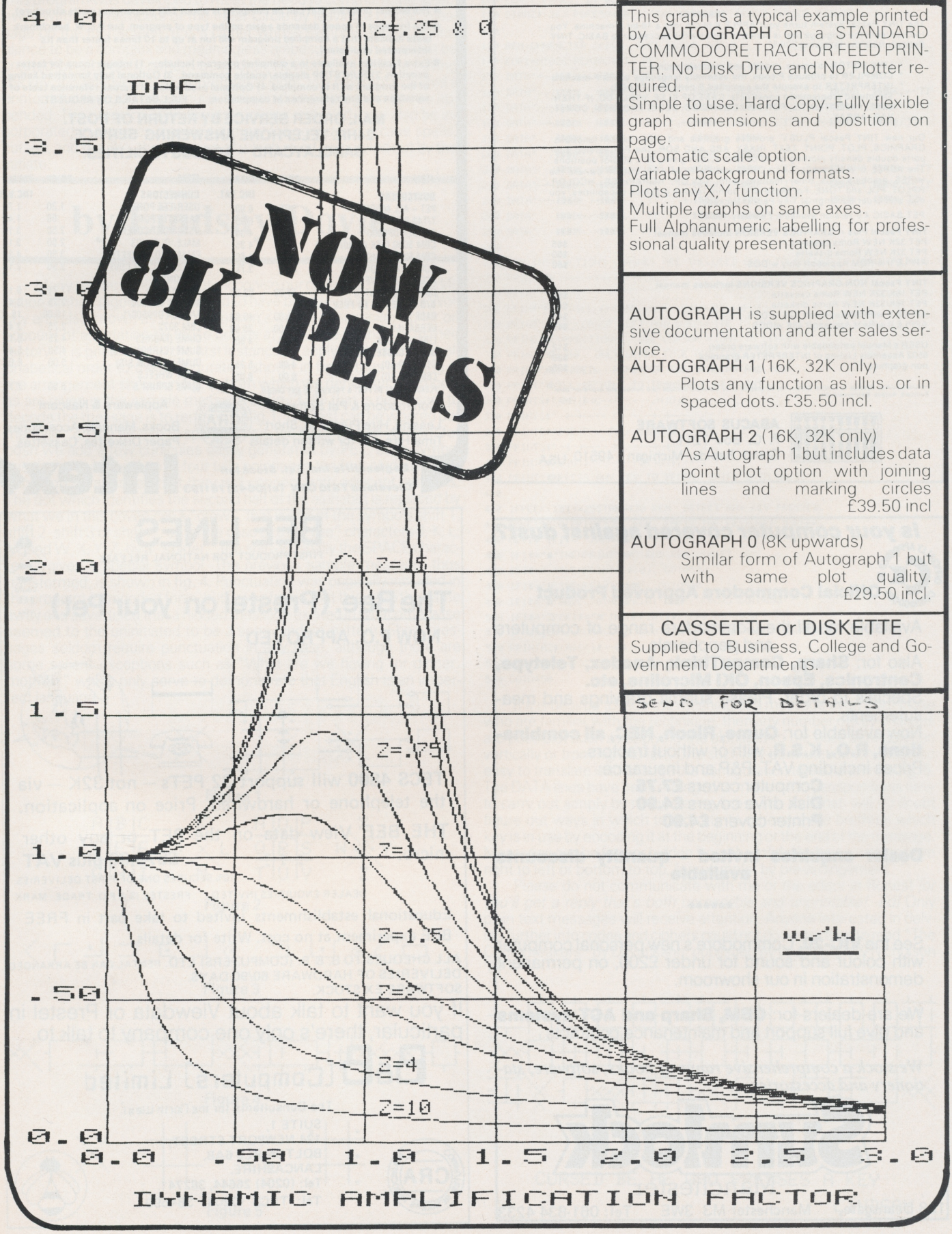

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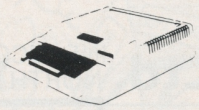

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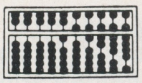

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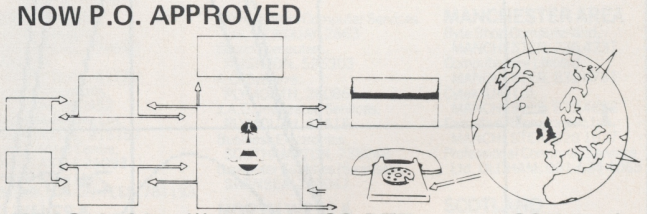

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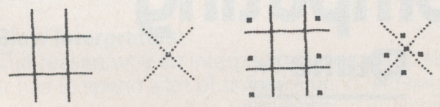
Runes

A Cipher Generator for PET

This program was developed to meet the need to communicate selectively with the members of the Inner Circle by leaving a cryptic message on the PET screen. It is a cipher whose symbols appear at first glance to be a complex and meaningless arabesque, such as might be created by a random pattern generator. However, to anyone having the key, it is relatively easy to interpret at sight. We have not included a printout function, as any popular "screen dump" program can be appended. The program, with the instructions removed, may also be incorporated in a games-master's armory for generating arcane spells, curses, and the like, the meaning of which must be puzzled out by the initiate.

by Lindsay Doyle

Many readers will no doubt recognise our code as a simple modification of the "pigpen" cipher, said to have been used by Cardinal Wolsey and also known as the Freemason's or the Rosicrucian cipher on account of adaptation by those bodies at one time or another in their history. It is generated in the first instance by applying the letters in alphabetical order to the configuration shown in fig.1, thus resulting in the arrangement shown in fig. 2, from which we derive such symbols as are given in the sample message of fig. 3. All that is necessary to decode the message is to remember fig.1. The rest can be worked out mentally "on the fly", so to speak. This is the hand-written version: for posh we add a few curlicules easily generated by PET. Each symbol has the possibility of up to four tails pointing in the four cardinal directions and so arranged that they will connect with adjacent symbols. The dot which identifies the second half of the alphabet is replaced by what we in this coven call a "crow", that is one of the symbols shift 1, shift 2, shift 3 or shift +, or, in the case of the "vee" characters J, K, L, M, and W, X, Y, Z, by a "spider", the shift-V. Finally the SPACE character is given a special symbol. The previous sample message, thus transformed, is shown in fig. 4. Punctuation was originally included in the program in uncoded form, but it was found that this gave the game away and advertised that a hidden message existed in what otherwise seemed to the uninitiated to be a semi-random pattern. Short messages seldom require punctuation in any case, although there are some salient exceptions such as "What are we having for dinner: mother?" which only serve to demonstrate that English is an imperfect language.



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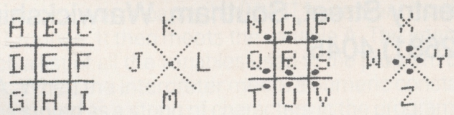

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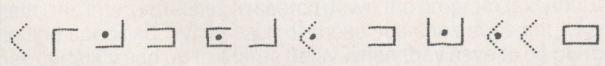

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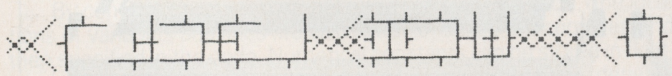

Figure 4

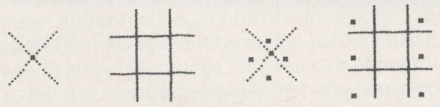

Figure 5

```
100 REM:7 RUNES  BY L. DOYLE   4/81.
110 DIMAZ$(26):POKE59468,12:S$="▶▶▶▶▶▶▶▶":REM:7 CURSOR RIGHTS
120 :
130 REM:CHARACTER CODES:  THEY CLEAR THE 3 X 3 SPACE:  AZ$(0)=SPACE SYMBOL.
140 FORI=0TO26:READAZ$(I):NEXT
150 DATA"┘┌┤▮▮▮▮▮┤├▮▮▮▮▮┐└┐"
160 DATA"  ▮▮▮▮▮  ├▮▮▮▮▮┐└┐","┘ ▮▮▮▮▮┤ ├▮▮▮▮▮┐└┐","┘ ▮▮▮▮▮┤ ▮▮▮▮▮┐└┐"
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260 :
270 REM:INSTRUCTIONS (DASHES ARE INCLUDED ONLY TO ASSIST IN TRANSCRIBING.)
280 PRINT"□--------------RUNES
290 PRINT"--------------"
300 PRINT"PET WILL ENCODE YOUR KEYBOARD INPUTS.
310 PRINT"■USE CURSOR LEFT AND OVERWRITE TO MAKE
320 PRINT"■CORRECTIONS.  USE CURSOR RIGHT TO LEAVE
330 PRINT"■BLANK.  ONLY UPPER CASE AND SPACE ARE
340 PRINT"■ENCODED.  REMEMBER THE DIAGRAM AND YOU
350 PRINT"■WILL BE ABLE TO TRANSLATE AT SIGHT.
360 PRINTS$"■■AIBIC--------.NIOIP.---.
370 PRINTS$"─┼┼┼───\/────┼┼┼───X/
380 PRINTS$"DIEIF---JKL--.QIRIS.-.WXY.
390 PRINTS$"─┼┼┼───/M\────┼┼┼───/Z\
400 PRINTS$"GIHII--------.TIUIV.---.
410 PRINT"■■PRESS ANY KEY TO BEGIN.  SHIFT @ TO QUIT.
420 :
430 IFPEEK(151)=255THEN430:REM:  DETECT ANY KEY PRESSED.
440 POKE158,0:PRINT"□";:REM:  EMPTY THE KEYBOARD BUFFER.
450 GETI$:IFI$=""THEN450
460 IFI$="@"THENPRINT"■■":END:REM:  SHIFT-@.
470 IFI$=" "THENPRINTAZ$(0);:GOTO530
480 IFI$="■"THENPRINT"▶▶▶";:GOTO530
490 IFI$="■"ANDC<>0THENPRINT"■■■";:C=C-3:GOTO450
500 IFI$="□"ORI$="S"THENPRINTI$;:C=0:GOTO450
510 IFASC(I$)<65ORASC(I$)>90THENPRINT"■■R■■■□";:GOTO450
520 PRINTAZ$(ASC(I$)-64);
530 C=C+3:IFC=>37THENPRINTCHR$(13)"■";:C=0
540 GOTO450
```
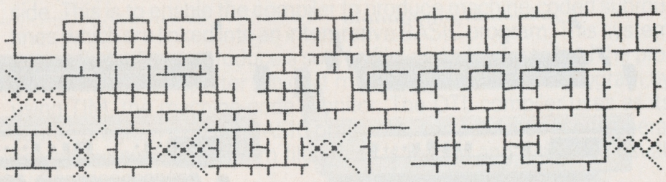

If it is desired to hide the meaning of a message even from those who are familiar with the technique, then any number of key-changes are possible, such as applying the alphabet to the base configuration vertically or from right to left. One such key-permutation which is also easy to translate is to change the configuration to that shown in fig. 5. The DATA lines have been arranged to make such transpositions easy to carry out simply by renumbering lines. The illuminati will no doubt figure out ways in which to indicate to others of the brethren which key is in use by encoding it at the beginning or the end of the message. Messages can be further hidden from the infidel by being written from right to left or bottom to top, for example, by pre-arrangement.

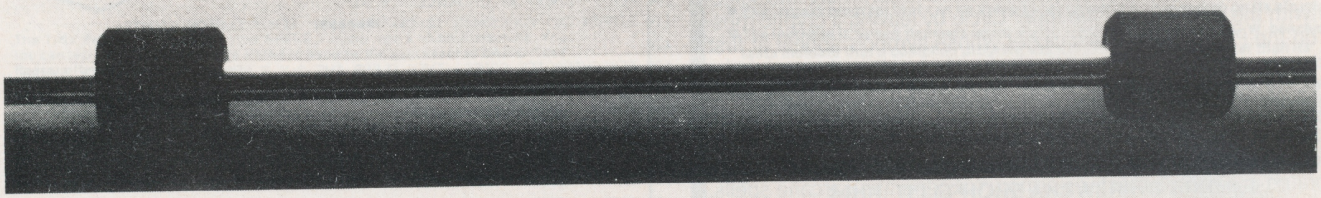
Please do not communicate with me or the editor in Runes! *[or you'll get a reply that's both unreadable and unprintable! -Ed]* Only plain text messages will receive attention. Anyone interested in delving further into codes and ciphers could not do better than to read "The Code Breakers" by David Kahn, published by Weidenfeld & Nicholson '67.



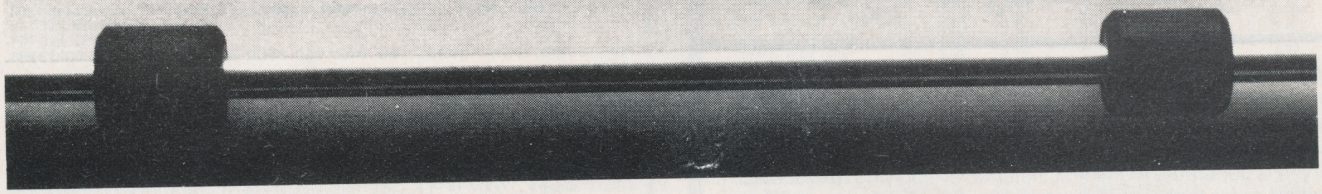
CURSED BE HE WHO PRESSES A KEY

LINDSAY

IF YOU DON'T WANT A WORD PROCESSING DOCUMENT THAT LOOKS LIKE THIS.



YOU NEED A PRINTER THAT PRINTS LIKE THIS.



The more your system can do, the better your terminal should be. That's why, if you're adding text editing capability to your data processing system, you should also think about adding a quality daisywheel terminal to replace the matrix terminal you're using now. And the best-quality terminal you can buy is one by Qume.

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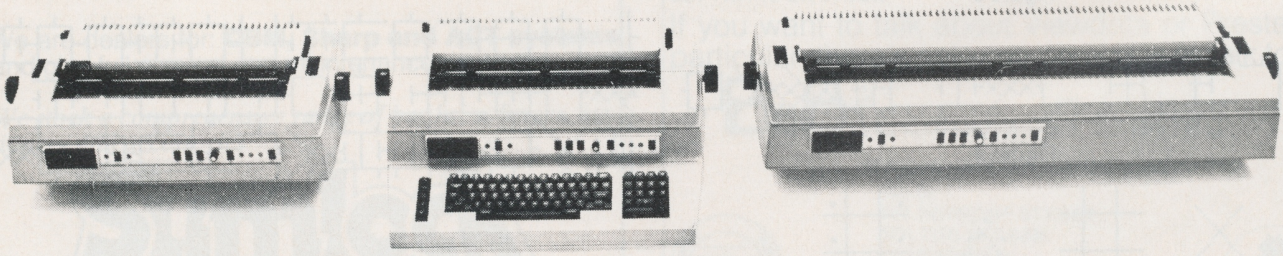
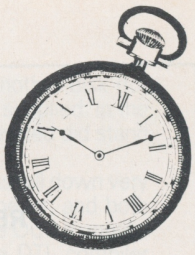


COMPILING FOR SPEED



Many first time PET buyers have been known to exclaim - Gosh, isn't it fast! But by the time you have written a 32K business program, the speed is decidedly less impressive. The answer lies in compiling the program to machine code. ***CHRIS PRESTON*** *explains this process and reviews two new suitable PET compilers.*

This issue of *Printout* is something of a landmark in the development of the PET. Many users have criticised the interpretive BASIC language which runs on the PET because it is quite slow, and over the past two years demand has been growing for a BASIC compiler. This demand has now been answered, not with one compiler but with two, and there are rumours of further developments from the States in the future. The two systems under review here are by Oxford Computer Systems (OCS) which is available for £150 in 3000 and 8000 versions, and Drive Technology Limited (DTL) which is at present only available in a 3000 form for £300, although an 8000 version is almost ready. The DTL system is also available in a special version (costing £900) which gives very good security against copying of programs, although at that price the market is obviously limited to professional software houses.

Before getting down to the nitty gritty of the review, it is important to explain exactly what the differences are between an interpretive language and a compiled language, and why the latter is generally considered to be superior for 'serious' programming. As we shall see, there are cons as well as pros. In fact, there are a wide range of systems from pure interpretive to pure compiled; various trade-offs being used to try and design the best system for a particular situation.

Let us start with the interpretive system resident in the PET. This has been often described in various publications but a quick summary here will not go amiss. An interpretive program is really a data file; the BASIC program is held in memory more or less as it is typed in. When the program is 'run', what happens is that the Interpreter (which is itself a machine-code program in ROM) starts reading the BASIC program as data and performing various functions according to that data. For example, the interpreter, on reaching a statement PRINT 5, decodes the PRINT statement, and jumps to its PRINT routine. This calls another routine to calculate the value to be printed, in this case 5, and then prints the value on the screen. The advantage of this system really boils down to the fact that the operations of entering, running and debugging a program can be made quite simple for the user without too much effort on the part of the interpreter writer. The disadvantage is that the BASIC program is not fast. This was no problem in the teaching environment for which BASIC was designed; it is a problem if people try to do too much with the system.

Slow Interpreters

The reason why an interpretive language is slow is that the interpreter has to spend a lot of time scanning (parsing) the program text and deciding what action to take, and also searching for the various items of data it needs. For example, take the statement PRINT A. The interpreter first has to parse the PRINT statement itself, and jump to the PRINT routine. It then meets the variable A. The interpreter now has to search a list of all the variables used in the program until it finds one called A. When the interpreter meets a numeric constant such as 156, which is stored as a string of characters in the program text, it has to convert the number into a format called FLOATING POINT before it can be used in the calculations. If the program contains a GOTO statement, the interpreter has to search down the program text until it finds the line specified. While each of these searches does not take long, they certainly add up to a large delay when they have to be performed regularly, which they do because the interpreter does not remember any of the things it has calculated or searched for once their immediate use is past.

By contrast a compiled program is itself machine code. The locations of variables and lines are calculated (once) by the compiler, and then specified in the code. Numerical constants can be stored in floating point, thus making for further improvements. In addition, depending upon how intelligent the compiler is, various optimisations can be implemented, such as not having to recalculate commonly used subexpressions in arithmetic equations or changing the order of arithmetic expressions to make execution faster. In particular a lot of attention can be given to array references. The main drawback with a compiled program is that it is somewhat larger than the corresponding interpretive program in terms of memory required.

Another limitation often mentioned is that compiled programs are harder to debug than interpretive ones. While this is certainly true for very small programs (i.e. those written by students learning to program) a good compiling system should make fault-tracing a lot easier than it is at present on the PET. The overhead involved is that changing a program involves recompiling it, but if the program is split into small modules which can be compiled separately and then linked together this time can be minimised. Unfortunately, neither compiler reviewed here is particularly strong in this department. Purists will also point out that if debugging a program involves hundreds of tiny alterations, then that program has not been properly "paper" tested before being keyed in, and it is a commonly-voiced objection to interpretive operating systems that they encourage lazy programming of the 'suck-it-and-see' variety.

The process of compiling a program is that of turning a 'source' program, which is keyed in by the user, into an 'object' program which is actually run by the user. The number of steps in between keying in a program and running it, and the number of options available at each stage, determine the usefulness and power of the compiler. In what might be termed a 'full' system the procedure followed is this. The user keys in his program using a text editor to produce a source file. This is then compiled by the compiler which produces as its main output a load module, of which more later, and a number of listings. These should include at least a copy of the source program, neatly tabulated and paged and including all the errors detected by the compiler. It is an advantage for documentation purposes if this can also be sent to a disk file, not just a printer. Some compilers can also produce an assembly listing of the machine code produced, which allows the user to modify parts of the program which are particularly time-critical.

Another aid is a cross-reference listing, which enables the programmer rapidly to find every line which references a particular variable or line number. Again, there should be an option for this output to be sent to a disk file.

Loading

The load module produced by the compiler is not an executable program. This module is typically part of a large program, which is to be merged with other modules and library subroutines to form the final program. This is done by a linking loader which takes care of the fact that there may be a GOTO in one module which references a line in another. The loader also enables the user to decide whereabouts in memory he wishes the program to reside. The compiled program consists of several parts. There is the "run-time system" which contains a library of subroutines used by the machine-code program, then there is the program itself and various data blocks containing constants, DATA elements, variables etc. A compiler may have features to allow the programmer to specify whereabouts in memory each of these blocks is to reside.

Now all that can take a long time (on the ICL 1900, the linking procedure can take as long as the compilation!) and a lot of the facilities available in such a system are not likely to be much used by BASIC programmers on a PET. For this reason, both of the compilers under review take short cuts. Neither compiler offers true linking, or the ability to relocate modules. The OCS compiler gives the programmer the ability to decide at compile time where he wishes his program to reside. This is to enable the compiler to produce machine-coded subroutines which are linked into an interpretive BASIC program. This system uses a text editor to produce a source file, and a loader to load the program into memory, after which it may be saved as a true program by using TIM, the machine-code monitor. The DTL compiler uses as its source program existing BASIC programs, and produces in one operation an executable program file which is loaded and run in the usual way.

The Two Systems Compared

The two compilers under review are not strictly speaking comparable, as they set out to achieve different objects. The OCS compiler is designed to produce very fast machine-code subroutines to be called by an interpretive program. It implements a very limited

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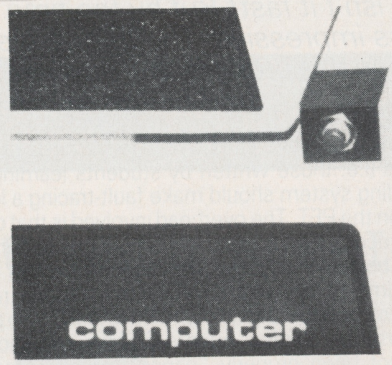

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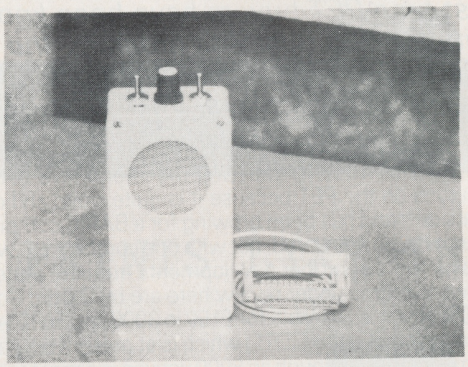

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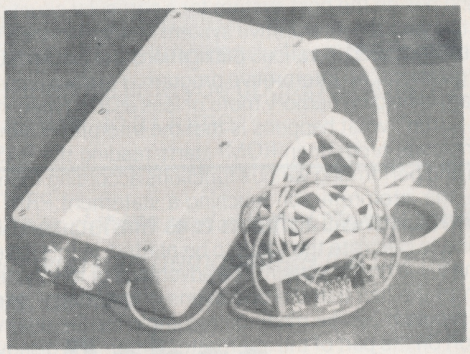

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version of BASIC, which only possesses integer arithmetic, and is intended mainly to be used for communications and peripheral control, where speed is of the essence, but not much actual calculation is involved. It is written in interpretive BASIC and so compilation time is very long (the benchmark program described below took almost 10 minutes to compile). The compiler is provided in two forms: resident and disk based. The first mode is really only used for learning the BASIC language implemented by the compiler, which is not standard. Only very small prgrams can be compiled, but they can be typed in, compiled and run all in memory, without having to change programs or worry too much about files. The disk version contains a text editor, compiler and loader and allows much larger programs to be created. Errors are not displayed as found, but instead are just listed at the end or the compilation, so if you have just changed the first line of a long program you don't find out for quite some time that you have made a mistake. It also collapsed very badly unless the source program was syntactically correct. There is an old 'joke' amongst venerable compiler writers which is always played upon newcomers to the art. "What is the job of a compiler?", they ask. "To turn a program written in a high-level language into machine code" comes back the unwitting answer. At this the old boys smile through their beards and turn back to the bar. "The job of a compiler is to tell the programmer where his errors are". It is very easy to write a compiler to compile correct programs; the difficulty lies in correctly detecting and reporting errors in the source text (Yes, I fell for it too!)

Extra Commands

When the OCS system was tested with faulty programs there were a distressing number of errors in the compiler, including an 'UNDEFINED STATEMENT ERROR' which should never occur if a program has been properly tested. The compiler also gave an error message (for which I could find no explanation in the manual) for the following correct expression: MID$(STR$(A),1,3* 3-1). The DTL compiler also dropped into TIM once under this testing, so there is obviously something wrong there as well. As far as the language goes, as mentioned earlier, many features have been omitted, such as DEF, there are no arithmetic functions (SIN, COS etc) and some of the relational and logical operators are not implemented (a ' > ' means greater than or equal to, & means AND). Also only single dimension arrays are permitted, but you have to pretend they are two dimensional, i.e. you must say A(5,0) when you mean A(5). Some of the string functions (LEN,MID$,CHR$,ASC) are provided, but these too must have two arguments: ASC(A$,0) for instance. However, on the credit side a lot of new statements have been added, including passing arrays to and from a Microsoft BASIC program or inserting a 'wedge' into PET BASIC to add extra commands using the same method as CompuThink and Toolkit. There are also new commands for interrupt and IEEE bus control which will be very useful for people who wish to drive non-standard peripheral devices without having to learn assembler. The compiler is also provided with a simple debugging utility although this does little apart from allowing breakpoints to be set in the program.

Integer Arithmetic

The DTL compiler is a much more powerful program for which a design aim was that any existing BASIC program could be compiled without alteration, and in fact has been used to compile itself. It has both floating point and integer arithmetic (the PET does not have inte-ger arithmetic: it converts integer variables to floating point before performing any calculations!) as well as all the standard PET features. It is not possible to link compiled routines into an interpretive program as there is no reason why the entire program should not be compiled. Whereas the OCS compiler is a true compiler which produces machine code output, the DTL compiler is a bit of a hybrid, in that its out put is 'semi-compiled', i.e. it is not machine code but a sequence of tokens which are executed by the time-run system. This has the advantage of producing very compact programs, but loses slightly from the point of view of execution speed. The 'code' produced is claimed to be half the size of standard BASIC. However, there is the fixed overhead of the run-time system, which occupies about 16 blocks (4K), so that programs of less then 45 blocks in length will not give any saving. The language used is claimed to be 100% compatible with PET BASIC, both on 3000 and 8000 versions. This means however, that no improvements have been added either. No debugging aids have been provided with the compiler, but in view of the compatibility claimed with standard BASIC, a program could be written and debugged in interpretive form and then compiled. Drive Technology also claim compatibility with all the assembler routines that many people have used to extend interpretive BASIC (e.g. CompuThink disks) and to speed up their BASIC programs. The compiler is also available in a special form for £900, which allows the compilation of protected programs using special disks available only from Drive Technology. The system used involves a special disk formatting technique which prevents disks being duplicated. A program file can be copied onto another disk (for backup purposes), but will not run except on the disk supplied. In the admittedly limited time available, the sample disk provided did stand up to any attempts made to crack the protection.

As far as presentation is concerned, both products fall down very badly. The manuals are merely photocopied, not typeset, and both contained typing and spelling errors, particularly in the OCS manuals. Considering the cost of the products (especially the DTL compiler which can cost £900), this is inexcusable. Both manuals were a hodge-podge of compiler operating manual, compiler reference manual and language reference manual, and neither was provided with an alphabetical index, so looking up some half-remembered fact could be very trying.

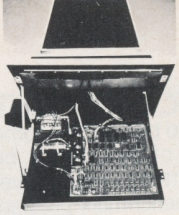
How Fast Are They?

In order to test just how fast the programs compiled by these two systems were, a benchmark program was written consisting of FOR-loops containing various arithmetic and string statements which form most of those parts of a program which will be speeded up by a compiler. Obviously disk and printer accesses are limited by the speed of the hardware; a compiled program may not be any faster at all if it is disk bound.

The first two benchmarks consist of a normal FOR-loop and an integer FOR-loop; the rest of the tests all use integer FOR-loops. Inter-

PROGRAM	INTERP	OSC	DTL
10 T1=TI	5.4	1	4.67
20 FOR I = 1 TO 5000			
30 NEXT			
40 PRINT (TI-T1)/60			
110 T1=TI	N/A	N/A	1.23
120 FOR I% = 1 TO 5000			
130 NEXT			
140 PRINT (TI-T1)/60			
210 T1=TI	12.9	2	4.15
220 FOR I% = 1 TO 5000			
225 A=A			
230 NEXT			
240 PRINT (TI-T1)/60			
310 T1=TI	21.12	3	10.35
320 FOR I% = 1 TO 5000			
325 A=A+5			
330 NEXT			
340 PRINT (TI-T1)/60			
410 T1=TI	44.32	12	31.13
420 FOR I% = 1 TO 5000			
425 A=H*(X+4*QA+R)/3			
430 NEXT			
440 PRINT (TI−T1)/60			
510 T1=TI	15.27	1	4.02
520 FOR I% = 1 TO 5000			
525 A$ = "1234567890 1234567890"			
530 NEXT			
540 PRINT (TI−T1)/60			
610 T1=TI	27.17	5	13.5
620 FOR I%= 1 TO 5000			
625 B$=A$+"1234567890 1234567890"			
630 NEXT			
640 PRINT (TI−T1)/60			
710 T1=TI	120.08	11	168.11
720 FOR I% = 1 TO 5000			
722 C$=LEFT$(A$,5)			
725 C$=RIGHT$(A$,5)			
728 C$=MID$(STR$(5*A),1,3*3−7)			
730 NEXT			
740 PRINT (TI−T1)/60			
810 T1=TI	112.05	0	13.95
820 FOR I% = 1 TO 5000			
830 GOTO920			
840 GOTO930			
850 GOTO940			
860 GOTO950			
870 GOTO960			
880 GOTO970			
890 GOTO980			
900 GOTO990			
910 GOTO1000			
920 GOTO840			
930 GOTO850			

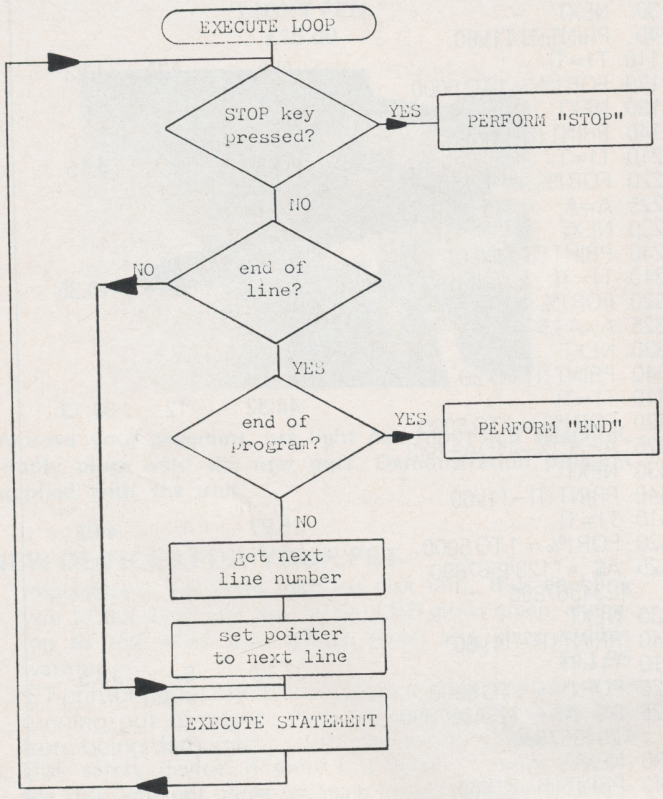
HOW BASIC WORKS



"How does Basic work?" is like asking "What is the meaning of life" - the answer is long and complex and no matter how deep you venture into the operating system, you never quite get to the bottom! This article is the second of a series of three by ***MIKE TODD****, designed to give keen programmers a good idea of what is going on inside the PET when you run a Basic program. So, if you've got your safety helmets and torches, we'll now venture into the depths.*

The Interpreter

The core of the interpreter starts at location $C6C4 which first checks if the stop key is pressed (in which case it performs the STOP command automatically). This routine then handles the BASIC line pointers; it checks for the end of the program (which is marked by three consecutive zero bytes) and exits if found; it also handles the occurrence of the end of a line (a single zero byte) by moving the pointers past the line number and forward pointer of the next line. The start of the current statement is saved (if not in direct mode) so that CONT will know where to pick up from if execution is stopped for any reason.



Flowchart of the main Execution Loop

Tokens

The statement is then interpreted by a routine at $C700. Here, the first character is checked to see if it is a token (i.e. if bit 7 = 1). If it is a valid command token (and not something like SIN or THEN), bit 7 is removed, and the resulting number (which is the position of the keyword in the table) is used to access the start address of the command routine from a table of addresses starting at $C000. The interpreter then jumps to the appropriate routine. If the keyword is GO, then a check is made for TO (since GOTO is the only keyword that can be split into two words) and if found, the GOTO routine is entered. If the first character is not a keyword, then the interpreter assumes that the command is LET (since LET can of course be omitted) and the LET routine is entered. Any invalid start to the line will result in the interpreter printing the SYNTAX ERROR message, flagging that an error has occurred, and then entering the main holding loop after printing READY.

Everything else that the PET does is under control of the keyword command set and consequently some of the more important commands will be examined in detail. However, all commands require the ability to retrieve a character from the BASIC program text and a routine is provided specifically for this purpose. Within this routine is a pointer which is incremented as soon as the routine is entered and then a character is retrieved from that location. If the character is a colon or a zero-byte (both of which signify the end of a statement) then the zero (Z) flag is set - if it is not a digit, the carry (C) flag is set. If the character is a space then the routine ignores it and reads the next non-space character.

Getting Characters

This routine, which starts at $0070, is often referred to as the CHRGET routine (pronounced "charget") and, being placed in RAM, is easily modified to allow additional commands to be added as in the Programmers Toolkit. Other user functions can also be implemented, and a variety of techniques are used to patch into this important routine.

As well as using the CHRGET routine at $0070, the interpreter will often enter at $0076 instead. This entry (sometimes referred to as the REGET or CHRGOT routine) does not increment the character pointer and is used to fetch a character from text that has already been read.

Variables

It is also worth examining how BASIC stores its variables. The simplest are the ordinary numeric variables. These are stored at the end of BASIC text, each taking seven bytes. Without describing the complex technique of "offset exponent, normalised binary floating point" storage, it is worth pointing out that *all* numeric operations are performed in this format. Even integer variables (stored in two byte fixed point format) are converted back to floating point whenever they are accessed. There is a floating point accumulator in RAM consisting of 6 bytes - the first is the exponent, the next 4 are the mantissa, and the 6th is the sign which is recovered from the stored form of the number. There are additional floating point accumulators which are used as workspace when evaluating expressions. The principal accumulator (FPACC#1) stores intermediate results and is also the accumulator upon which the trigonometric functions operate.

Numbers in arrays are stored in a similar format (except that integers use only two bytes instead of seven and floating point numbers five instead of seven) - but there is a header to each array which contains the array name, the number of bytes in the array and information about the dimensions of the array. However, these are stored after ordinary variables which means that every time a new ordinary variable is defined, the entire array table has to be shifted up seven bytes.

Strings

Ordinary string variables are also stored in seven bytes, although only three are actually used for string information. These three bytes are called a string descriptor, with the first byte holding the number of characters in the string and the other two the address of the first character in the string. If a string is defined in a program (e.g. A$="TEST STRING"), the string is already in RAM and the descriptor will point to the characters within the text area. However, as soon as strings are manipulated they need to be stored somewhere else, otherwise a string operation could actually corrupt the BASIC program text!

This problem is overcome by using the empty space after the arrays. But since the arrays are moved up each time a new variable is defined and of course the end of arrays will change if a new array is created, strings cannot be placed immediately after the arrays. If they were, the strings would have to be moved up as variables were created, and all string descriptors modified accordingly - a mammoth

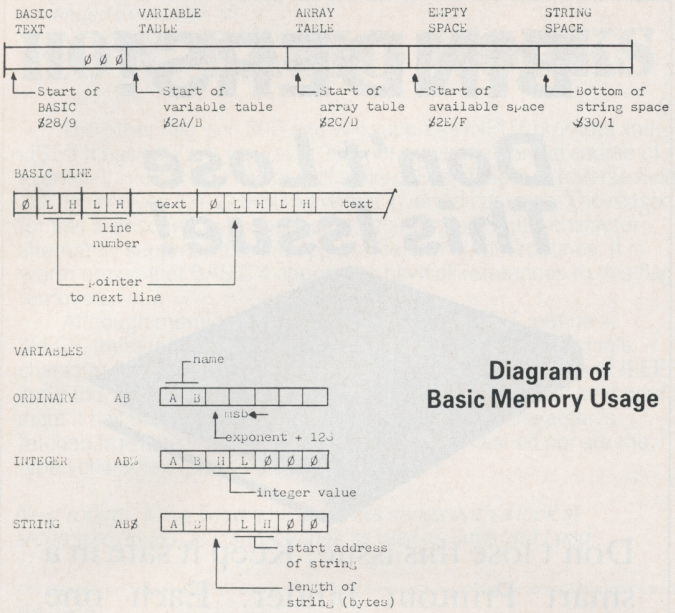


Diagram of Basic Memory Usage

task. Instead, strings are built starting at the end of RAM. A pointer is set to the end of RAM, and whenever a string is created this pointer is moved down by the number of characters in the string and the string stored starting at that point. Unfortunately, if another string is defined, this pointer is moved down yet again, until it reaches the end of the arrays.

Garbage

When this pointer crashes into the arrays, there are two alternative solutions. The first is to abort and print an OUT OF MEMORY error - a defeatist answer! The other solution assumes that there will be strings in this area which are no longer of use - in other words the original descriptor for that string has been changed because the variable has been redefined and has therefore been rewritten elsewhere in the string storage area. Thus the string storage contains garbage, and so a routine, referred to as "garbage collect" is involved to weed out all those unreferenced strings. It does it as follows:

A pointer is set to the end of RAM (and so the top of string space) - all string descriptions are checked (in both ordinary and array string variables) to find which pointer is closest in value to this garbage collection pointer. The position of the final character of the string is calculated by adding its length to the start of the string and the string is moved up to fill any unused space - the string descriptor is then updated and the string space pointer moved down to the start of the string.

All string variables are then checked for the next string descriptor below this pointer and the same process repeated until all strings have been checked and moved up to take up the space occupied by the garbage thereby releasing space for more strings. Only when the garbage collect routine fails to release enough space does the OUT OF MEMORY error occur.

In other words, the string space is scanned from top to bottom; all unused strings are deleted and all used strings moved up to overwrite them.

Minutes or Hours

Unfortunately, if a large number of strings are being used (especially if a large string array is defined) then the garbage collect routine has a lot of work to do. For instance, if the only strings in use are all the elements of a 100 element array, then the string space will have 100 strings in it and there will have to be 100 searches through all string descriptors - amounting to 10000 descriptor checks! If there are more than 1000 strings then over a million checks will have to be done as well as 1000 string moves and updates - no wonder garbage collect can take several minutes (or even hours !!!). BASIC 4 (which is supplied in the new 4000 and 8000 series PETs and is available as an upgrade for older PETs) has solved this problem by adding two bytes extra to each string; these are used by a much improved garbage collection routine to an acceptable level.

Input & Output

Before going on to consider a few BASIC commands, it is worth considering how the PET operating system handles input and output. There are three main types of output routine directing characters to the screen, the cassettes or the IEEE bus. All have their own separate routines, but can be accessed through a single output routine at $FFD2. This routine checks the contents of location $B0 (often referred to as the CMD output device number) and uses this to access the appropriate output routine. If set to device number 3, the screen output routine at $E3D8 is used. This routine handles all ASCII characters (including clear-screen, cursor movements etc.) and places the character on the screen, updating the screen pointers.

There is a routine at $E6EA whose function is to wait for the correct moment and then place the character (now in its screen memory form) into screen RAM. In fact, it waits for the SYNC signal to go to zero indicating that the video circuitry is not accessing the screen RAM and the character can be placed on the screen without producing the "snow" effects which can be seen when POKEing direct onto the screen on earlier PETs. POKE59458,62 will stop the routine having to wait since it forces the SYNC signal to appear zero at all times. This is the speed-up facility which has been publicised elsewhere. Unfortunately, later models have had a hardware change which prevents this speed-up working. Instead it has the effect of reducing the screen to only 2.5 lines of characters and also speeds up the interrupt significantly thereby speeding up the cursor. However, this comes about because the POKE command causes two integrated circuits inside the PET to be in conflict and could cause damage to one or the other. Therefore, on newer PETs one cannot gain this significant speed advantage - however, in BASIC 4, the SYNC signal is no longer checked (because the later models have been built to avoid the "snow" effects) and therefore full speed can be achieved.

IEEE Management

If the CMD output device is greater than 3 then the IEEE handshake routines are called, while any other value is assumed to be a cassette operation and the character is placed in the buffer, the buffer pointer is incremented and if it is 192 the entire buffer contents are written to tape and the buffer reset. It is worth noting that CHR$(10) - line feed - is ignored when sent to tape to avoid it interfering with the data when it is read back.

Whenever the $FFD2 output routine is called, it is assumed that not only has $B0 been set correctly, but that a channel has been opened to the cassette or IEEE bus. This ensures that IEEE or cassette protocols have been observed and the data is sent to a valid device.

Keyboard

In a similar way, there is an input routine at $FFCF which uses $AF to indicate the device number from which input will be taken. If it is zero, then the keyboard is taken as the input device although strictly speaking the input is taken from the screen. As soon as the routine is entered (and $AF=0), the cursor is set flashing and the current position of the cursor logged as the start of the line (thereby avoiding any prompts being accepted as part of the input). Thereafter characters are read from the keyboard buffer and placed on the screen until the RETURN key is hit at which time the routine is left, returning the first character on the line. Subsequent calls to the routine do not set the cursor flashing, nor do they allow further input to be accepted. Instead they return successive characters on the line until the last character is read. The next call of the routine starts the process over again. Note that any movement of the cursor off the input line resets the cursor log to the start of the line and the input routine will accept all characters on the line as valid input - this explains why, in BASIC, the INPUT command operates normally unless the cursor is moved up or down, in which case the prompt is included in the returned string. It is also part of the reason why the same thing happens when receiving input off the bottom line of the screen.

Like the output routine, the input routine assumes that all necessary protocols have been handled (normally through the OPEN command). Characters from cassette are read from the cassette buffer until such time as the buffer pointer reaches 192 at which time the next data block is read from tape. Alternatively, the IEEE routine simply handles the necessary handshaking on the IEEE bus.

Error Messages

Unfortunately, this is not the full story, since there are occasions when output to the screen has to be suppressed. There are two flags which are used to suppress screen output; the first is at $0E and contains the logical file number of the most recently accessed input and output files. Therefore if $0E is zero both input and output are normal and this allows INPUT error messages for instance to be printed. If either is off normal (i.e. if an INPUT # or OUTPUT # command has just been obeyed) then these error messages are suppressed.

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HOW BASIC WORKS

The other flag is in $0D and will suppress INPUT prompts and LIST if it has bit 7=1. However, it is not set in the normal course of events - it is only set if, as part of a direct line of input, a reverse field "O" is received (i.e. CHR$(15)) within inverted commas. The reason for this is obscure, but subsequent occurrences of this character alternately suppress and unsuppress certain output routines. It is worth noting that BASIC 4 appears to have all references to this flag removed.

Although mention has been made of the INPUT routine at $FFCF, there is another routine at $FFE4 which collects a single character from the specified device. In the case of cassette or IEEE input this is no different to the usual input routine. But for keyboard input it has the effect of GET - where only a single character is fetched from the keyboard buffer, no cursor is flashed nor are the typed characters placed on the screen.

Next month, Mike Todd concludes his series with a look at arithmetic, loops, and subroutines as well as Save and Load.

Our thanks to the Independent PET User Group in whose newsletter an earlier version of Mike Todd's article first appeared.

Which Package?

continued from page 35

The main criticisms centre on the way some functions have been implemented: the fact that what you see on the screen isn't what you get from the printer: the disk directory - especially its unhelpful (and unnecessary) habit of overwriting memory when it's read in: and above all that sloppy and unprofessional manual.

In its latest version *Wordcraft* scores highly on documentation, not least because it is not bedevilled by Americanisms - they're fine for Americans, but since it costs so little in time and money to write a manual specifically for national custom it seems a penny-pinching solution the way some suppliers deny us a British version of documentation.

Maybe the Americans feel that some way about *Wordcraft's* manual - but I doubt it. It is arranged logically, and the documentation provides a better solution to the twin needs of learning and reference.

The status display is good and so are the facilities offered. *Wordcraft* has the better disk directory (still not perfect, though) and a much better form-letter capability. Version F of the package includes a number of functions clearly intended to match *WordPro's* background printing, and to provide at least one global function (to print all chapters of a document). *Wordcraft's* screen displays the text very much as it will appear when you print; and in general the way the system is used corresponds much more closely to the reality of the office environment - especially when the operating modes and access to particular facilities is so much more logical and natural for the non-computerised beginner.

If you require or can make effective use of the extra goodies in *WordPro,* or maybe if your users are going to be quick at grasping technical terms and ideas, you should consider that package. But if you want a PET word processor for your office staff, the Best Buy is *Wordcraft.*

COMPILING FOR SPEED.

continued from page 57

```
940   GOTO870
950   GOTO880
960   GOTO890
970   GOTO900
980   GOTO910
1000  NEXT
1010  PRINT (TI-T1)/60
```

pretive BASIC does not allow integer FOR-loops, so the control measurements were made using standard floating-point FOR-loops. On the OCS system all arithmetic is integer so the floating-point FOR-loop test had to be omitted. The OCS compiler did not allow the TI function, which made precise timings of loops very difficult, so the figures given should be read with this in mind.

The last benchmark produced two interesting events. First, the OCS compiler gave a spurious error message on line 728, so the timing produced could be meaningless. More interesting however, was the fact that the DTL compiler produced a timing which was slower than the interpretive result! The delay was produced by line 728, and splitting up the MID$ expression reduced the time for the loop to the magnitude expected. The message for users of this system is not to use complicated expressions.

The Test Program

The part of the program from line 310 to line 340 was repeated with 50 variable declarations before the FOR-loop. With this amendment, the interpretive time rose to 41 seconds, while the compiled times were unaffected. This demonstrates the time wasted by the PET BASIC interpreter in searching the variable table in large programs. In this case, allowing for the overhead involved in the FOR-loop, the time taken for the assignment in line 325 is more than doubled! The routine from line 810 onwards demonstrates the time taken up in searching the BASIC program text for a given line. This search time is proportional to the distance between the current line and the target line for a forward jump, and proportional to the distance between the start of the program and the target line for a jump to a lower line number, thus emphasising the fact that the larger an interpretive program gets, the slower it becomes. Beware, all ye who are fond of writing 31.9999kB monsters!

The speed improvements claimed by the two manufacturers are 50-150 times for the OCS compiler and about 20 times for the DTL. These claimed times cannot be compared with the timings achieved in the short program above, as the speed of execution of an interpretive program decreases rapidly as its size increases because more time is spent searching lists. However, we would tentatively suggest that these figures have been carefully chosen to show each compiler in its best light, and cannot be taken as applying to all programs.

Conclusion

As stated at the start of the review, the two compilers are not really comparable. However, for most people, the DTL compiler will be the one to buy. The OCS compiler, although turning out admirably fast code, is of limited application, and will really only be used by people who need that speed, but have a low requirement as far as the power of the programming language is concerned, typically communications specialists. The DTL compiler produces very compact code, but at the cost of some speed as compared with a true compiler. It is also completely compatible with standard BASIC, but there are no language extensions or debugging facilities provided. Anyone who is interested in this compiler should note that it is being marketed by Dataview Limited (0206 865835), to whom all enquiries should be addressed. Oxford Systems can be contacted on (0993) 812838.

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D

Data

This is what it's all about; everyone knows data is what the computer 'does' or 'uses' or 'has'. Data is just information which is processed, stored or produced by a computer. There are two wrinkles, though. In fact 'data' is a plural noun – one piece of data is a 'datum'; but you don't find many people following the strict grammatical rule. The language moves on and so data is generally singular. In any case, it is more helpful to think of data as a composite rather than a collection of individual items. The other interesting point is the distinction between data and *information*. Data is the abstract and uncoloured subject on which the blind, rule-following computer performs its programmed operations; information is data which has been given some meaning, the kind of data humans can use.

Database

Sometimes two words, but not in our style. It is a large file of data organised so that all users draw upon a common pool of consistent up-to-date information. A database usually needs large backing memories and a filing system developed with all potential users and applications in mind. The emphasis is on the shared pool. In a non-database environment – which is the norm, of course – each user generally has to set up separate files for each application. The database approach means that if the programmer knows the information is already there, it is no trouble at all to get at it – in theory. Micro systems typically lack the storage capacity to make a database worthwhile.

Direct access

Ability to extract required data immediately from memory, regardless of its location. As opposed to sequential or *serial* access, so you can't have direct-access mag tape systems.

DOS

An *operating system* most of which resides on disc rather than permanently in memory (which would be too small to hold all of a decent operating system) or on tape (it is slow to find the required bit and read it into memory to be executed). Operating systems have names: most disc operating systems are simply called DOS by the manufacturer.

Dump

Transfer the contents of main memory on to backing storage, typically to give you a security copy.

E

EPROM

Erasable programmable read-only memory. We'll deal with ROM and memory in more depth later but as a quick rule of thumb, ROM is read-only memory supplied as ready-programmed. PROM is read-only memory supplied empty and programmed by you, if you have the special tools. EPROM is PROM which can be erased and re-programmed.

The sharp-witted will spot that EPROM sounds a little like RAM, which is random-access memory (or read/write memory). RAM is the 'user' memory in a system; you can load programs into it and read from it at will.

The difference between EPROM and RAM is that with EPROM you need a special erasing device which utilises ultra-violet light – with RAM the new programming over-writes the old, as a rule. With EPROM you need a special re-programming device, the same 'PROM burner' required for non-erasable PROM.

F

Field

A file consists of records, a record consists of fields. It is easy enough to produce a logical definition of a field – something like 'an area where data of a given type will be found for processing or storage as a single entity'. In practice, the definition is likely to be practical and obvious. For instance, membership records might comprise fields for name, address lines, membership number, and membership fees paid. Or you might set up the system at a greater level of detail plus one field for surname, two for first names, one each for house number, street, town, county, postcode, country ... and so on.

File

An attempt to organise related information; or a collection of records. In practice, a file in computer terms is the essential input for a processing program. Some systems require you to set up your programs as individual files; you read the (program) file into memory, and that file contains all the instructions you need. Data files contain all the data a particular program needs; a subscription program might use one file of subscriber records, another with subscription rates.

Flag

This is what a person does towards the end of a day of glossary-writing. For a computer, a flag is a sequence of bits which signals the beginning and the end of a piece of data, or indicates something about it.

Typically, a flag is an indicator attached to a data field; it is likely to be a single bit position. For example, if you have a record to be printed you might set a flag to '1'. Your print program would then hunt around the files looking for all records with the flag set.

Floating point

Sometimes called scientific notation. It's a method of holding very large numbers in limited amounts of storage. The number is stored in the form of argument and exponent – don't worry if that doesn't mean much to you, it's just a way of taking up less space in memory. In practice a number would be stored as the significant digits in the number and a power of 10. For instance, 9,999 might be stored as 9.999E3 – which is the same as 9.999×10^3.

If all this means nothing to you, just think of floating point as a nifty way of handling numbers – so if you want to use numbers a lot, make sure your computer has a floating point facility.

Floating point gives you maximum accuracy. You might also look on floating point as a clever way of manipulating numbers so that no matter how big or small the number is, it always takes up the same amount of storage space.

Frankly, most micros do not have the ability to handle floating point, and unless you're a scientist or a numbers nut you probably don't need it. There are some plug-in S100 boards which give you floating point arithmetic commands, implemented as microcode in PROM.

Floating point extends a computer's calculation abilities and simplifies the programming of complicated arithmetic operations.

The opposite of floating point is, would you believe, fixed point, which are ordinary, familiar decimal numbers with a point in the same position all the time – after the whole number, before the fraction – remember?

Floppy disc

Floppy discs are, as the name implies, a flexible storage medium, rather like the plastic 45 rpm records given away as promotions. Each disc lives in a protective envelope – the read/write head passes through a slit in the cover. We discuss disc storage in depth under our *disc* entry.

Floppies are in a range of sizes from 5¼ in. mini-floppies to double-sided, double-density, full-size floppies. A normal mini-diskette holds between 50 and 90KB; a typical double-sided, double-density mini-floppy holds about 280KB – and some can store IMB. Average 8in. floppies go from a minimum of 250-315KB to a maximum of around 1.4 megabytes (though Burroughs has one that will store 3MB).

Access time for floppies is reasonably fast: they are not expensive; they are easy to handle and to store. Rumour has it that the hole in the middle bends, too.

H

Handshake

What you get from writing too many glossary definitions too quickly. Alternatively, it's a term which refers to communication between two parts of a system, typically a terminal and the central processor. It means that the receiving end is confirming that it has, in fact, received something. It's a pleasantly graphic term, isn't it? Still, it is a bit heavy; you can now forget it.

I

Initialise

To reset a system to its starting condition – typically to set various parts of a program to starting values so that the program will behave the same way each time it is repeated.

You also have to initialise newly-bought discs, which means to ensure that there are no sneaky bugs and flaws in them that will prevent them working happily on your computer. Most tapes and some discs come pre-initialised these days, though.

Dennis Jarrett continues his translation of the worst excesses of computer jargon in the next issue.

For those who feel they cannot wait a month, this useful book is available in paperback form from booksellers and many computer dealers.

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INSIDE STORIES

Right thinking people will join me in condeming David Low and ACT for their decision to import the pornographic 'Interlude' program. Naturally I felt it my duty to investigate this outrage personally. The program starts by asking a series of very personal questions before prescribing various "interludes". In the interests of **science, and with the greatest distaste, Mrs Trader and I sampled** *interludes Nos. 63, 21, 84, 115 & 222. If anyone knows a cure for exhaustion and a way of getting jam off sheepskin, I will gladly send them my copy of this disgraceful program.*

A Tale of Two Sackings: After being fired as distributors of **Word-pro,** Commodore signed up to market **Wordcraft.** Now it is happening again. It really might be less embarrassing if the Commodore wrote his own word processing software in future.

Q. When can we expect a pocket size business system? **A.** *Any time after next month when Sony will be releasing their 3½" floppy disk system. It measures a pocketable 4x2½x5 inches, weighs less than 2 lbs and stores 437K bytes. Trade price will be $250. A double sided version is in the works. Hint: Commodore are still looking at Japanese disk drives for the VIC .....*

I see that **Scientific American**, long a favourite among computing folk, has censored an advertisement for, of all things, salad dressing. Hoping to cash in on the popularity of 'Thousand Island Dressing', a St. Louis entrepreneur had placed an ad. for 'Three Mile Island Dressing'. According to the copy, this would "melt down on your salad with a flavour explosion". The **American** rejected it on the grounds of "tastelessness".

Big Bad Bob Gleadow's first move on taking over as Boss of Commodore was to rent a luxurious all-glass skyscraper to accommodate his all-female staff of "personal assistants". The arrival of Les Girls has played havoc with morale in the technical department. Some wag has amended the operating systems of every PET in the building so that instead of SAVE you get RAVE; LUST instead of LIST; RUB instead of RUN; instead of CONT you get [That's quite enough of that - Ed].

The scribblers of Silicon Valley trade paper *InfoWorld* are regretting an April Fools jape at the expense of their readers. In a spoof word processor review mention was made of a special Rewrite feature that would convert text into the style of one of twenty famous authors, including Norman Mailer, Balzac, Adolph Hitler and the Marquis de Sade. So many readers wrote in for details that the hacks are now working feverishly to develop the system for real. I shall let you know if the editorial style of *InfoWorld* suddenly shows signs of literary merit.

If you have tuned in to the Citizens Band around 27MHz lately and heard what sounds like high speed morse, you may well have been monitoring communication between two or more microcomputers. CBers say there are more than 200,000 sets in the UK already and that number could double when CB becomes legal this autumn. So a fair proportion of local electronic mail could end up going by radio for free. Which would come as an unpleasant surprise to Buzby and his buddies up at British Telecoms who are banking on a bonanza of extra business for the telephone service.

As I predicted, American reviewers have given seven foot micro Guru Adam Osborne's "portable" business system a rough ride. Most of them missed the point magnificently. The point being its price: $1795 (£800) which actually includes **$1500 worth** of software. Nor is Osborne having better luck elsewhere. Initial elation that his 'PET/CBM Personal Computer Guide' was being considered for the National Book Award wore off rapidly once it was learned that it had been nominated for the fiction category. A spokesman described the chapter on relative data files as a *masterpiece of imagination.*

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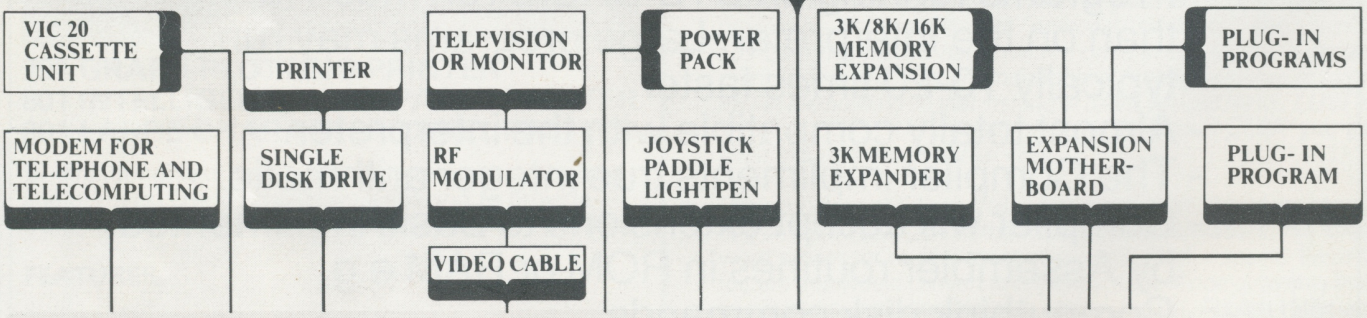

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